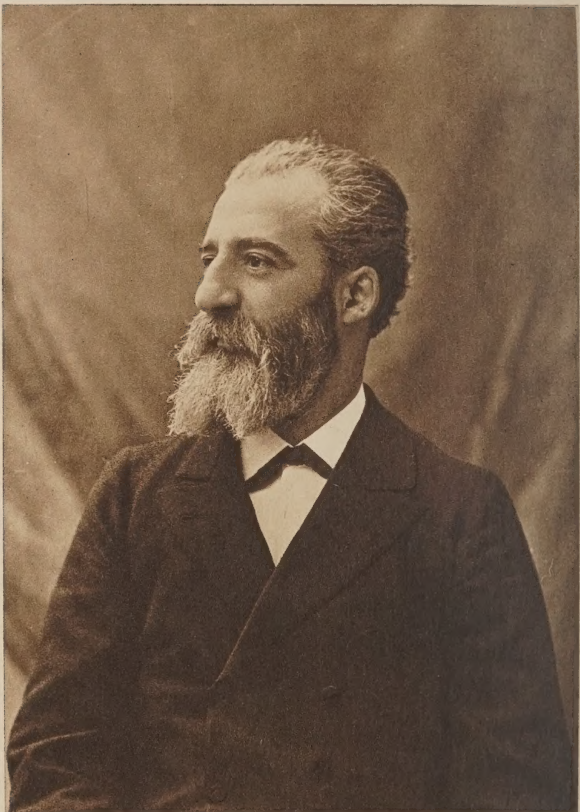

Henri Moissan

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VAN NOSTRAND'S
CHEMICAL ANNUAL

1913

A HAND-BOOK OF USEFUL DATA

FOR ANALYTICAL, MANUFACTURING, AND INVESTIGATING CHEMISTS, AND CHEMICAL STUDENTS

THIRD ISSUE

Revised with addition of new tables and a section on STOICHIOMETRY

EDITED BY

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PREFACE TO THE FIRST ISSUE

The amount of chemical literature published each year has steadily increased at a very rapid rate. It has become more and more difficult for the busy worker to gather from this mass of literature the facts which are of interest and use to him. Much valuable material is of little use because scattered through the literature and therefore inaccessible.

The publication of the Chemical Annual was undertaken as an attempt to overcome this difficulty, at least in part. It has been limited in its scope almost entirely to numerical data, inasmuch as other year books have not aimed to cover this field, and inasmuch as such data cannot generally be carried in the mind, but must be readily accessible for use. To republish all matter of this kind would be both unnecessary and impracticable. The attempt has been made to select and tabulate only that which is of fairly general interest and utility. The investigator in a special field would probably always prefer to go to the original source for the information he wishes. In the preparation of the Chemical Annual the attempt has been made to produce a convenient reference book of numerical data. All tables and numerical data have been quoted from the original source wherever possible, notwithstanding the labor which this work involved.

The tables useful in the calculation of analytical results were first compiled. It is believed that this portion of the Annual is quite complete and will meet all ordinary requirements. All molecular weights as well as the factors for the calculation of analytical results have been calculated from the International Atomic Weights of 1906. As most of the numbers have been calculated several times it is believed that few errors will be found. The molecular weights and other figures have been carried out further beyond the decimal point than is necessary for most calculations. It was thought that the tables would be of more general use if

each chemist were thus at liberty to round off the figures to suit the accuracy of the work in hand.

In collecting the specific gravity tables those most adapted to American practice have been selected. When the specific gravity is given in terms of the Baumé degrees, the so-called American standard as given in Table XXXIII has been adhered to. Where a different Baumé scale had been used in a table the figures have been recalculated to conform with the American standard.

In the review of chemical literature, which contains more than one thousand references to journal articles, the attempt has been made to tabulate and index the important articles of the year in such a manner that the progress made during the year on any given subject will be apparent and its literature easily and quickly found. Any attempt to give a synopsis of the articles would have made the Annual very bulky, and in any case is of doubtful utility.

In a similar manner a list has been made of the most important American and foreign books on chemical subjects which have been published during the year. While the preparation of this list has been somewhat difficult it is hoped that few if any important books have been omitted. Both this list and the list of journal articles include publications from January 1, 1905, to June 1, 1906.

The expense and labor involved in the publication of a book of this kind has been found to be very considerable, so that even with the assistance of a number of contributors, whose interest and coöperation it has been found possible to enlist, the scope of the first issue of the Annual is much more limited than it had been hoped possible to make it. If the demand for such a publication justifies it, the scope of the Annual will be considerably increased in future issues.

The editor desires to express his appreciation of the interest taken and encouragement given by many chemists who did not have the time to prepare matter for publication. He is especially grateful to those whose names appear on the list of contributors and who spared neither time nor labor in the effort to make their contributions accurate and complete.

November, 1906.

PREFACE TO THE SECOND ISSUE

The favorable reception accorded the first issue of "The Chemical Annual" has encouraged the publishers to make a thorough revision for the second issue, which they feel will increase its value as a work of reference and extend its use amongst chemists. The revision of the tables published in the first issue has required a great deal more labor than had been anticipated, because of the surprisingly large number of determinations of the physical constants of the chemical elements and compounds published each year. The large number of changes made in the international table of atomic weights for 1909 also necessitated the recalculation of most of the molecular weights as well as of the chemical factors.

As a thorough revision of this kind could not be made in a year, it seemed advisable to abandon, at least temporarily, the original intention of issuing the volume annually. A number of entirely new tables have been added in the present issue. A table of the physical constants of the alkaloids has been prepared by Dr. Atherton Seidell, and a similar one of the essential oils by Albert E. Seeker. A greal deal of labor was involved in the preparation of these tables, as it was necessary to collect the data from many widely scattered sources. Mr. Seeker has also revised the tables on fats and oils. The recently calculated table of the density of carbon dioxide by Professor Parr, a table giving the melting points and the composition of fusible alloys, as well as a number of other tables of minor importance, have been introduced. The Review of Chemical Literature, as well as the List of New Books, gives the important publications which have appeared since the first issue of "The Chemical Annual."

The table of Gravimetric Factors and their Logarithms has been entirely recalculated by Mr. M. C. Whipple, and it is hoped that this important table as well as the table of Molecular Weights and their Logarithms is free from error.

The editor desires to express his appreciation of the interest taken by many chemists who have called his attention to errors in the first issue, and who have made valuable suggestions of tables to be added. It is hoped that advantage can be taken in future editions of many of these suggestions which were not received early enough to be used in the present volume.

The editor desires to acknowledge the great obligation which he is under to the contributors who have prepared tables for the present issue. The greatest care and pains have been taken to secure accuracy and completeness of data.

The editor and publishers submit this volume with every confidence in its accuracy and value as a reference manual to the profession.

J. C. OLSEN.

June 21, 1909.

PREFACE TO THE THIRD ISSUE

In preparing the third issue of "The Chemical Annual" the standard adopted for the first and second issues has been maintained and the physical constants of the chemical elements and compounds have been revised in accordance with the new data published since the last issue. No change, however, has been made in the table of organic compounds. All other tables have been carefully revised and brought up to date. Molecular weights and factors have been recalculated in accordance with the 1913 table of atomic weights.

A considerable number of new tables have been added, such as the solubility of gases in water, fuming sulphuric acid, the alcohol tables of the Bureau of Standards, specific gravity tables of methyl alcohol, refractometer tables of methyl and ethyl alcohol and various other specific gravity tables.

The section on Thermochemistry has been increased by the addition of tables giving heats of formation solution, neutralization and avidity of acids.

The Review of Chemical Literature giving a list of the more important journal articles has been omitted because the field is now well covered by various abstract journals. At the suggestion of Dr. R. Harman Ashley a section on Stoichiometry has been added. The fundamental units of mass and weight, specific gravity and other physical constants have been defined and a full discussion given of the methods of solution of various problems often met by chemists. A considerable number of problems to be solved has been given, affording practice by students in chemical calculations involving the use of the tables published in the Chemical Annual. The entire field of chemical calculations has not been covered but additions may be made in future issues.

J. C. OLSEN.

Brooklyn, N. Y.
Nov. 1, 1913.

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I.—INTERNATIONAL ATOMIC WEIGHTS FOR 1913 *

O = 16

Name.	Symbol.	Atomic Weight.	Name.	Symbol.	Atomic Weight.
Aluminium	Al	27.1	Molybdenum.....	Mo	96.0
Antimony	Sb	120.2	Neodymium	Nd	144.3
Argon..........	A	39.88	Neon...........	Ne	20.2
Arsenic.........	As	74.96	Nickel..........	Ni	58.68
Barium	Ba	137.37	Niton...........	Nt	222.4
Bismuth........	Bi	208.0	Nitrogen........	N	14.01
Boron..........	B	11.0	Osmium	Os	190.9
Bromine........	Br	79.92	Oxygen.........	O	16.00
Cadmium.......	Cd	112.40	Palladium.......	Pd	106.7
Caesium.........	Cs	132.81	Phosphorus......	P	31.04
Calcium	Ca	40.07	Platinum	Pt	195.2
Carbon.........	C	12.00	Potassium.......	K	39.10
Cerium.........	Ce	140.25	Praseodymium...	Pr	140.6
Chlorine........	Cl	35.46	Radium.........	Ra	226.4
Chromium	Cr	52.0	Rhodium........	Rh	102.9
Cobalt..........	Co	58.97	Rubidium.......	Rb	85.45
Columbium......	Cb	93.5	Ruthenium......	Ru	101.7
Copper.........	Cu	63.57	Samarium.......	Sm	150.4
Dysprosium	Dy	162.5	Scandium.......	Sc	44.1
Erbium.........	Er	167.7	Selenium........	Se	79.2
Europium.......	Eu	152.0	Silicon..........	Si	28.3
Fluorine........	F	19.0	Silver..........	Ag	107.88
Gadolinium	Gd	157.3	Sodium.........	Na	23.00
Gallium.........	Ga	69.9	Strontium.......	Sr	87.63
Germanium......	Ge	72.5	Sulphur.........	S	32.07
Glucinum.......	Gl	9.1	Tantalum.......	Ta	181.5
Gold............	Au	197.2	Tellurium.......	Te	127.5
Helium.........	He	3.99	Terbium........	Tb	159.2
Holmium........	Ho	163.5	Thallium........	Tl	204.0
Hydrogen.......	H	1.008	Thorium........	Th	232.4
Indium.........	In	114.8	Thulium........	Tm	168.5
Iodine..........	I	126.92	Tin	Sn	119.0
Iridium.........	Ir	193.1	Titanium.......	Ti	48.1
Iron............	Fe	55.84	Tungsten........	W	184.0
Krypton	Kr	82.92	Uranium........	U	238.5
Lanthanum......	La	139.0	Vanadium.......	V	51.0
Lead...........	Pb	207.10	Xenon..........	Xe	130.2
Lithium.........	Li	6.94	Ytterbium.......	Yb	172.0
Lutecium.......	Lu	174.0	(Neoytterbium)		
Magnesium......	Mg	24.32	Yttrium...	Yt	89.0
Manganese......	Mn	54.93	Zinc............	Zn	65.37
Mercury	Hg	200.6	Zirconium.......	Zr	90.6

* Compiled by the International Committee on Atomic Weights consisting of F. W. Clarke, W. Ostwald, T. E. Thorpe, and G. Urbain.

II. — MENDELEEFF'S PERIODIC SYSTEM OF THE ELEMENTS

Revised by CHARLES BASKERVILLE

Series.	Zero Group.	Group I.	Group II.	Group III.	Group IV.	Group V.	Group VI.	Group VII.	
0	x								
1	y	H = 1.008							
2	He = 3.99	Li = 6.94	Gl = 9.1	B = 11.0	C = 12.00	N = 14.01	O = 16.00	F = 19	
3	Ne = 20.2	Na = 23.00	Mg = 24.32	Al = 27.1	Si = 28.3	P = 31.04	S = 32.07	Cl = 35.46	
4	A = 39.9	K = 39.10	Ca = 40.07	Sc = 44.1	Ti = 48.1	V = 51.0	Cr. = 52.0	Mn = 54.93	Fe = 55.84 Co = 58.97 Ni = 58.68 (Cu)
5		Cu = 63.57	Zn = 65.37	Ga = 69.9	Ge = 72.5	As = 74.96	Se = 79.2	Br = 79.92	
6	Kr = 82.92	Rb = 85.45	Sr = 87.63	Yt = 89.0	Zr = 90.6	Cb = 93.5	Mo = 96.0		Ru = 101.7 Rh = 102.9 Pd = 106.7 (Ag)
7		Ag = 107.88	Cd = 112.4	In = 114.8	Sn = 119.0	Sb = 120.2	Te = 127.5	I = 126.92	
8	Xe = 130.2	Cs = 132.81	Ba = 137.37	La = 139.0	Ce = 140.25	(Pr = 140.6)	(Nd = 144.3)		Sa = 150.4 Eu = 152 Gd = 157.3
9		—	—	Er = 167.7	—	Yb = 172.0	—	—	
10	—	—	—	—	—	Ta = 181.5	W = 184.0	—	Os = 190.9 Ir = 193.1 Pt = 195.2 (Au)
11		Au = 197.2	Hg = 200.0	Tl = 204.0	Pb = 207.10	Bi = 208			
12	Nt = 222.4		Ra = 226.4		Th = 232.4		U = 238.5		

Rare earth metals not placed: — Dy = 162.5, Lu = 174, Tb = 159.2, Tm = 168.5.

Name.	Formula.	Molecular Weight.	Specific Gravity, Air = 1. Calculated.	Specific Gravity, Air = 1. Observed.	Weight in Grams of 1 Liter at 0°, 760 mm. at Sea Level, lat. 45°.
Acetylene	C_2H_2	26.016	0.8988	0.92	1.1620
Air			1.0000		1.2926
Ammonia	NH_3	17.034	0.5895	0.5963	0.7708
Argon	A	39.88	1.379	1.3778	1.7828
Arsine	AsH_3	77.984	2.696	2.695	3.485
Bromine	Br_2	159.84	5.5249	5.524 (227.9°)	7.1426
Butane	C_4H_{10}	58.08	2.0065	2.01	2.594
Carbon dioxide	CO_2	44.00	1.5201	1.52932	1.9768
Carbon monoxide	CO	28.00	0.9673	0.96735	1.2504
Carbon oxysulphide	COS	60.07	2.0749	2.1046	2.6825
Chlorine	Cl_2	70.92	2.489	2.491	3.1666
Cyanogen	C_2N_2	52.02	1.7993	1.8064	2.3261
Ethane	C_2H_6	30.048	1.0381	1.075	1.3421
Ethylene	C_2H_4	28.032	0.9784	0.9852	1.2520
Fluorine	F_2	38.0	1.313	1.26	1.697
Helium	He	3.99	0.1382	0.1368	0.1787
Hydrobromic acid	HBr	80.928	2.7973	2.71	3.6163
Hydrochloric acid	HCl	36.468	1.2595	1.2686	1.6398
Hydrofluoric acid	HF	20.008	0.691	0.7126	0.894
Hydroiodic acid	HI	127.928	4.4172	4.3757	5.7106
Hydrogen	H_2	2.016	0.06965	0.06953	0.089873
Hydrogen selenide	H_2Se	81.216	2.806	2.795	3.627
Hydrogen sulphide	H_2S	34.086	1.1773	1.1895	1.5392
Hydrogen telluride	H_2Te	129.516	4.478	4.489	5.789
Krypton	Kr	82.92	2.826	2.818	3.654
Methane	CH_4	16.032	0.5539	0.5576	0.7168
Neon	Ne	20.2	0.691	0.674	0.893
Nitric oxide	NO	30.01	1.0378	1.0368	1.3402
Nitrous oxide	N_2O	44.02	1.5229	1.5300	1.9777
Nitrogen	N_2	28.02	0.9701	0.96758	1.2507
atmospheric	$N_2 + A$ etc.			0.97209	1.25718
Nitrogen dioxide	NO_2	46.01	1.5906	1.60 (135°)	2.0563
" "	N_2O_4	92.02	3.1812	2.65 (26.7°)	4.1126
Nitrosyl chloride	NOCl	65.47	2.2625	2.31	2.925
Oxygen	O_2	32.00	1.1055	1.1055	1.4292
Phosphine	PH_3	34.064	1.175	1.214	1.520
Propylene	C_3H_6	42.048	1.4527	1.498	1.8780
Silicon fluoride	SiF_4	104.3	3.607	3.60	4.663
Sulphur dioxide	SO_2	64.07	2.2131	2.2641	2.9266
Xenon	X	130.2	4.422	4.422	5.717

* A considerable portion of this table is quoted from Landolt-Börnstein Phys-Chem. Tabellen, 1905, p. 222.

IV.—PHYSICAL CONSTANTS

Number.	Name.	Symbol.	Atomic Weight. O = 16.	Molecular Weight.	Specific Gravity Water = 1. Air = 1 (A). Hydrogen = 1 (D).	Atomic Vol. $\frac{\text{At. Wt.}}{\text{Sp. Gr.}}$	Specific Heat at 0° C.
1	**Aluminium**	Al	27.1	......	2.708 $2.72^{16^{\circ}}_{4}$	10.00 9.96	.2220
2	**Antimony**	Sb	120.2	......	6.62	18.2	.0495
3	**Argon**, gas	A	39.88	39.88	1.379 A. 19.96 D.	.....	.1233
4	liquid	A	39.88	......	$1.4046^{-186^{\circ}}$	28.5	....
5	**Arsenic**, amorph.	As	74.96	299.84	$4.716^{14^{\circ}}$	15.9	.0758 (21°–65°)
6	cryst	As	74.96	299.84	$5.727^{14^{\circ}}$	13.2	.0830 (21°–65°)
7	**Barium**	Ba	137.37	......	3.75	36.7	....
8	**Bismuth**	Bi	208.	......	9.7474	21.3	.03013
9	**Boron**, amorph.	B	11.0	......	2.45	4.5	.3066
10	cryst.	B	11.0	......	2.53–2.68	4.2	0.165(21°)
11	**Bromine**, gas	Br_2	79.92	159.84	$5.8691^{60^{\circ}}$A.	.....	.0555(83°)
12	liquid	Br_2	79.92	159.84	$3.1883^{0^{\circ}}$	25	.1071
13	**Cadmium**	Cd	112.40	112.4	$8.642^{17^{\circ}}$	13	.0548
14	**Caesium**	Cs	132.81	......	$1.87^{20^{\circ}}$	70.6	.04817
15	**Calcium**	Ca	40.07	......	$1.5446^{29.2^{\circ}}$	25.9	.1453
16	**Carbon**, amorph.	C	12.00	......	1.75–2.10	6.0	.241
17	graphite	C	12.00	......	2.10–2.585	5	.202
18	diamond	C	12.00	......	3.47–3.5585	3.4	.1469
19	**Cerium**	Ce	140.25	......	$6.92^{25^{\circ}}$	20.2	.05112
20	**Chlorine**, gas	Cl	35.46	70.92	$2.491^{0^{\circ}}$A.	.....	.1241
21	liquid	Cl	35.46	......	$1.4405^{0^{\circ}}$	24.6	.2262
22	**Chromium**	Cr	52.0	......	6.92^{20}	7.5	.10394
23	**Cobalt**	Co	58.97	......	$8.718^{21^{\circ}}_{4}$	6.8	.1030
24	**Columbium** (Niobium)	Cb	93.5	......	$7.06^{15^{\circ}}_{15}$	13.3	....
25	**Copper**	Cu	63.57	......	8.91–8.96	7.1	.0936
26	**Erbium**	Er	167.4	......	4.77	35.1	....
27	**Fluorine**, gas	F	19	38	1.31°A^{15}.	.....	....
28	liquid	F	19	38	$1.14^{-187^{\circ}}$	16.7	....
29	**Gadolinium**	Gd	157.3	......	1.31	120.1	....
30	**Gallium**	Ga	69.9	......	$5.95^{24^{\circ}}$	11.8	.079
31	**Germanium**	Ge	72.5	......	5.469^{20}_{20}	13.3	.0737
32	**Glucinum** (Beryllium)	Gl	9.1	......	$1.85^{20^{\circ}}$	4.9	....
33	**Gold**	Au	197.2	......	19.32	10.2	.0316
34	**Helium**, gas	He	3.99	4	0.1368 A 1.98 D.	21.1 20.1	....

* K = the number of grams of water which can be raised from 0° to 1° C. by the heat which passes through a cubic centimeter of the substance in one

† Reciprocal of the resistance in ohms of a centimeter cube of the

OF THE ELEMENTS

Number.	At. Heat Sp. Heat × At. Wt.	Electrical Conductivity † at 0° C.	Thermal Conductivity K* at 0° C. Ag = 1.00.	Linear Coefficient of Expansion.	At °C.	Melting Point, °C.	Boiling Point, °C.
1	6.02	324000	.3435	$.0_4245$	40°	657°	> 2200°
2	5.95	27100	.0442	$.0_41152$	40°	630°	1500–1700
3	4.92		$.0_43894$			− 187.9°	− 186.1°
4							
5	5.69	28600		$.0_40559$	40°		< 360°
6	6.23					sublimes at	449½°
7						850°	vol. 950°
8	6.27	9260	.0177	$.0_41346$	40°	269°	1435°
9	3.37					infusible	sublimes at
10	1.82					infusible	3500°
11	4.44						
12	8.57					− 7.3°	58.7
13	6.16	146000	.2213	$.0_43069$	40°	321°	778°
14	6.41	25400		$.0_339482$	27–100°	26.37°	670°
15	5.83	95000				805°	
16	2.89			$.0_4054$	40°	sublimes	3500°
17	2.22			$.0_40786$	40°	sublimes	3500°
18	1.76			$.0_40118$	40°	sublimes	3500°
19	6.28	13950				635°	
20	4.40					− 102°	− 33.6°
21	8.02			$.0_21978$	0–10°		
22	5.42					1505°	2200°
23	6.08	83200		$.0_41236$	40°	1490°	
24						1950°	
25	5.95	640600	.7198	$.0_41678$	40°	1083° 1065° (in air)	2310°
26							
27						− 223°	− 187°
28						− 223°	− 187°
29							
30	5.53					30.15°	
31	5.34					916°	vol. 1350°
32						> 960°	
33	6.23	468000	.7003	$.0_41470$	0–100°	1062°	2530°
34			$.0_33386$			− 269°	− 268.5°

second when the temperature of the opposite sides of the cube are maintained at a difference of 1° C.

substance.

Number.	Name.	Symbol.	Atomic Weight. O = 16.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). Hydrogen = 1 (D).	Atomic Vol. At. Wt. / Sp. Gr.	Specific Heat at 0° C.
1	**Hydrogen**, gas...	H	1.008	2.016	0.06949 A.	.....	3.410
2	liquid.........	H	1.008	2.016	$0.700^{-252.5°}$	1.4	6.
3	**Indium**.........	In	114.8	......	7.12^{13}_{4}	16.1	.05695
4	**Iodine**, gas	I	126.92	......	8.72 A.	.....	$.0336^{206°}$
5	solid.........	I	126.92	253.84	$4.948^{17°}$	25.7	.05412
6	**Iridium**, spongy..	Ir	193.1	......	15.86	12.2	....
7	crystalline	Ir	193.1	......	22.42	8.6	.0323
8	**Iron**, pure.......	Fe	55.84	......	7.85–7.88	7.1	.1162
9	wrought......	Fe	55.84	......	7.86	7.1	.1130
10	steel..........	Fe	55.84	......	7.60–7.80	7.3	.1066
11	gray pig......	Fe	55.84	......	7.03–7.13	7.9	....
12	white pig.....	Fe	55.84	......	7.58–7.73	7.3	.1050
13	**Krypton**, gas....	Kr	82.92	81.8	{ 2.818 A. { 40.78 D.	.....	....
14	liquid........	Kr	82.92	......	$2.155^{-152°}$	38.5	....
15	**Lanthanum**......	La	139.0	......	6.1545	22.6	.04485
16	**Lead**...........	Pb	207.10	......	11.34	18.2	.0310
17	**Lithium**........	Li	6.94	......	$0.534^{20°}$	12.97	0.8366
18	**Magnesium**......	Mg	24.32	......	1.69–1.75	14.3	.2456
19	**Manganese**......	Mn	54.93	......	7.42	7.4	.1217
20	**Mercury**........	Hg	200.6	200.6	13.5953^{0}_{4}	14.7	.03346
21	**Molybdenum**....	Mo	96.0	......	8.6–9.01	10.9	.0659
22	**Neodymium**.....	Nd	144.3	......	6.9563	20.7	....
23	**Neon**...........	Ne	20.2	......	{ 0.674 A. { 9.96 D.	.....	....
24	**Nickel**..........	Ni	58.68	......	8.6–8.93	6.7	.1084
25	**Nitrogen**, gas....	N	14.01	28.00	0.96737 A.	.....	.2438
26	liquid........	N	14.01	......	$0.8042^{-195.5°}$	17.5	....
27	**Osmium**........	Os	190.9	......	22.48	8.5	.03113
28	**Oxygen**, gas.....	O	16	32	1.10535 A.	.....	.2175
29	liquid........	O	16	32	$1.1181^{-182.5°}$	14.3	....
30	**Ozone**	O_3	......	48	1.658 A.	.....	....
31	**Palladium**.......	Pd	106.7	......	11.4–11.9	9.2	.0592
32	**Phosphorus**, yel..	P	31.04	124	$1.8232^{20°}$	17.0	.202
33	red..........	P	31.04	124	$2.296^{16°}$	13.5	.1829
34	liquid........	P	31.04	......	$1.764^{44.3°}$	11.9	....
35	**Platinum**.......	Pt	195.2	......	$21.16^{24°}_{24}$	9.2	.0323
36	**Potassium**.......	K	39.10	......	$0.875^{13°}$	44.6	.1662
37	**Praseodymium**...	Pr	140.6	......	6.4754	21.6	....
38	**Radium**.........	Ra	226.4	......	....	.....	....
39	**Rhodium**........	Rh	102.9	......	12.1	8.5	.05803
40	**Rubidium**.......	Rb	85.45	......	$1.532^{20°}$	55.85	....

Number.	At. Heat Sp. Heat × At. Wt.	Electrical Conductivity at 0° C.	Thermal Conductivity K* at 0° C. Ag = 1.00.	Linear Coefficient of Expansion.	At °C.	Melting Point, °C.	Boiling Point, °C.
1	3.44	....	$.0_3 3270$	....	....	−259°	−252.5°
2	6.05	....	....	....	....	....	....
3	6.56	119500	....	$.0_4 417$	40°	115°	700°
4	4.27	....	....	....	....	....	....
5	6.86	....	....	$.0_4 837$	−190–17	114.2°	184.35°
6	....	....	....	....	....	2250°	....
7	6.23	....	....	$.0_4 0700$	40°	1950°	....
8	6.50	131000	.1665	$.0_4 1182$	0°–100°	1505°	2450°
9	6.32	....	.2070	$.0_4 11$	0°–100°	1600°	....
10	5.96	63000	.1300	$.0_4 11$	0°–100°	1375°	....
11	....	10200–	....	$.0_4 1061$	40°	1275°	....
12	5.87	11300	.1490	....	....	1075°	....
13	....	....	....	....	....	−169°	−151.7°
14	....	....	....	....	....	....	....
15	6.23	....	....	....	....	810°	....
16	3.52	50400	.0836	$.0_4 2924$	40°	327°	1525°
17	5.86	119000	....	....	....	186°	>1400°
18	5.98	230000	.3760	$.0_4 2694$	40°	650°	1120°
19	6.70	....	....	....	....	1225°	1900°
20	6.69	10630	.0148	$.0_3 182$	0°–100°	−38.85°	357.33°
21	6.33	....	....	....	....	2500°	....
22	....	....	....	....	....	840°	....
23	....	....	....	....	....	−253°	−243°
24	6.36	144200	.1420	$.0_4 1279$	40°	1450°	....
25	3.42	....	$.0_4 524$	....	....	−213°	−195.5°
26	....	....	....	....	....	....	....
27	5.95	105300	....	$.0_4 0657$	40°	2700°	....
28	3.48	....	$.0_4 563$	....	....	−227°	−182.7°
29	....	....	....	....	....	....	....
30	....	....	....	....	....	decomp. 270°	−119°
31	6.32	97900	.1683	$.0_4 1176$	40°	1550°	....
32	6.26	....	....	$.0_3 124$	0°–44°	44.1°	290°
33	5.67	....	....	....	....	725°	350° (yel.)
34	....	....	....	....	....	....	....
35	6.29	91200	.1664	$.0_4 0899$	40°	1753°	....
36	6.51	150500	....	$.0_4 83$	0°–50°	62.5°	757.5°
37	....	....	....	....	....	940°	....
38	....	....	....	....	....	700°	....
39	5.97	....	....	$.0_4 0850$	40°	1970°	....
40	....	....	....	....	....	38.5°	696°

Number.	Name.	Symbol.	Atomic Weight. O = 16.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A) Hydrogen = 1 (D).	Atomic Vol. At. Wt. / Sp. Gr.	Specific Heat at 0° C.
1	Ruthenium, spon	Ru	101.7	......	8.6	11.8	....
2	melted........	Ru	101.7	......	11.4	8.9	....
3	cryst.........	Ru	101.7	......	$12.26^{0°}_{0}$	8.3	.0611
4	Samarium.......	Sm	150.4	......	7.7–7.8	19.4	....
5	Scandium.......	Sc	44.1	......	....	.....	....
6	Selenium, amorph.	Se	79.2	633.6	$4.26–4.28^{25°}$	18.5	.09533
7	monoclinic....	Se	79.2	633.6	$4.47^{25°}$	17.7	.08401
8	hexagonal.....	Se	79.2	633.6	$4.8^{25°}$	16.5	....
9	Silicon, amorph..	Si	28.3	......	2.00	14.2	$0.214^{21°}$
10	cryst.........	Si	28.30	......	$2.49^{10°}$	11.4	$.1697^{22°}$
11	Silver...........	Ag	107.88	......	10.53	10.2	.0559
12	Sodium..........	Na	23.00	......	$0.9735^{13.5°}$	23.7	.2934
13	Strontium.......	Sr	87.63	......	2.54	34.5	....
	Sulphur,						
14	amorphous soft	S	32.07	256.56	$1.9556^{0°}$	16.4	....
15	" yellow	S	32.07	256.56	2.046	15.6	....
16	rhombic......	Sα	32.07	256.56	$2.05–2.07^{0°}$	15.6	.1728
17	monoclinic....	Sβ	32.07	256.56	1.958	16.4	.1809
18	plastic........	Sγ	32.07	256.56	1.92	16.7	.1902
19	Tantalum.......	Ta	181.5	......	$14.49^{16°}_{18}$	12.5	.03017
20	Tellurium, amorp.	Te	127.5	255.0	$6.015^{20°}$	21.2	.0525
21	cryst.........	Te	127.5	255.0	6.27	20.4	.0475
22	Terbium........	Tb	159.2	......	....	.....	....
23	Thallium........	Tl	204.0	......	11.85	17.2	.0326
24	Thorium, amorph.	Th	232.40	......	$11.00^{17°}_{17}$	21.1	....
25	cryst.........	Th	232.40	......	11.23	20.7	....
26	Thulium........	Tm	168 5	......	....	.....	....
27	Tin, gray........	Sn	119.0	......	$5.8466^{15°}$	20.3	.0545
28	rhombic......	Sn	119.0	......	6.53–6.56	18.2	.0559
29	tetragonal.....	Sn	119.0	......	$7.2984^{15°}$	16.3	.0559
30	Titanium........	Ti	48.1	......	$4.50^{17.5°}$	10.7	.1125
31	Tungsten........	W	184.0	......	18.77	9.8	.0336
32	Uranium........	U	238.5	......	$18.685^{13°}_{4}$	12.8	.0280
33	Vanadium.......	V	51.0	......	$6.025^{15°}_{15}$	8.5	.1240
34	Xenon, gas	Xe	130.2	......	{ 4.422 A. / 63.5 D	.....	....
35	liquid	Xe	130.2	......	$3.52^{-109.1°}$	37.0	....
36	Ytterbium.......	Yb	172.0	......	....	.....	....
37	Yttrium.........	Yt	89.0	......	$3.80^{15°}$	23.4	....
38	Zinc............	Zn	65.37	65.37	$7.142^{16°}$	9.2	.09356
39	Zirconium, amorp.	Zr	90.6	......	4.15	21.8	....
40	cryst.........	Zr	90.6	......	$6.40^{18°}$	14.2	.0660

Number.	At. Heat Sp. Heat × At. Wt	Electrical Conductivity at 0° Wt.	Thermal Conductivity K* at 0° C. Ag = 1.00.	Linear Coefficient of Expansion.	At °C.	Melting Point, °C.	Boiling Point, °C.
1	....	....	....	....	....	>1950°	....
2	....	....	....	....	....	2000°	....
3	6.21	....	....	$.0_40963$	40°	2000°	....
4	....	....	....	....	....	1350°	....
5	....	....	....	....	....	1200°	....
6	7.55	....	....	....	....	50°	690°
7	6.65	....	....	$.0_43680$	40°	170°–180°	690°
8	....	....	....	....	....	217°	690°
9	6.06	....	....	....	....	....	3500°
10	4.82	200–15600	....	$.0_40763$	40°	1450°	3500°
11	6.04	681200	1.000	$.0_41921$	40°	961.5°	1955°
12	6.76	211000	.365	$.0_472$	0°–50°	97.6°	877.5°
13	....	40300	....	....	....	900°	....
14	....	....	....	....	....	>120°	444.6°
15	....	....	....	....	....	....	444.6°
16	5.54	....	....	$.0_46413$	40°	114.5°	444.6°
17	5.80	....	....	....	....	119.25°	444.6°
18	6.10	....	....	....	....	....	444.6°
19	5.46	60600	....	$.0_408$	....	2900°	....
20	6.69	....	....	$.0_41675$	40°	446°	1390°
21	6.07	46600	....	$.0_43440$	0°–20°	452°	1390°
22	....	....	....	....	....	....	....
23	6.65	56800	....	$.0_43021$	40°	302°	1280°
24	....	....	....	....	....	>1700°	....
25	....	....	....	....	....	....	....
26	....	....	....	....	....	....	....
27	6.49	....	....	....	....	stable < 20°	....
28	6.65	....	....	....	....	stable > 170°	>2200°
29	6.65	76600	.1528	$.0_42234$	40°	232°	1450–1600
30	5.41	....	....	....	....	2200°	....
31	6.18	....	....	....	....	2800°	....
32	6.68	....	....	....	....	800°	....
33	5.90	....	....	....	....	1680°	....
34	....	....	....	....	....	−140°	−109.1°
35	....	....	....	....	....	....	....
36	....	....	....	....	....	1800°	....
37	....	....	....	....	....	1250°	....
38	6.12	186000	.2653	$.0_42918$	40°	419°	918°
39	....	....	....	....	....	....	....
40	5.98	....	....	....	....	2350°	....

V.—GRAVIMETRIC FACTORS AND THEIR LOGARITHMS

A	Weighed or Found.	Required.	A*		B†	
B	Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Aluminium, Al = 27.1						
	Al_2O_3	Al	0.53033	$\bar{1}.72455$	1.8856	0.27545
		Al_4C_3	0.70646	$\bar{1}.84909$	1.41550	0.15091
		$AlCl_3$	2.61220	0.41700	0.38282	$\bar{1}.58300$
		$AlPO_4$	2.38966	0.37834	0.41841	$\bar{1}.62166$
		$Al_2(SO_4)_3$	3.35040	0.52509	0.29848	$\bar{1}.47491$
		$Al_2(SO_4)_3.18H_2O$	6.52350	0.81448	0.15330	$\bar{1}.18552$
		$K_2SO_4.Al_2(SO_4)_3.24H_2O$	9.28650	0.96785	0.10768	$\bar{1}.03215$
		$(NH_4)_2SO_4.Al_2(SO_4)_3.24H_2O$	8.87420	0.94813	0.11269	$\bar{1}.05187$
	$AlPO_4$	Al	0.22193	$\bar{1}.34621$	0.45060	0.65379
		Al_2O_3	0.41841	$\bar{1}.62166$	0.23897	0.37834
	CaF_2	AlF_3	0.71817	$\bar{1}.85623$	1.39242	0.14377
	P_2O_5	$AlPO_4$	1.71895	0.23526	0.58175	$\bar{1}.76474$
Ammonium, NH_4 = 18.04						
	Ag	NH_4Br	0.90813	$\bar{1}.95815$	1.10110	0.04185
		NH_4Cl	0.49592	$\bar{1}.69541$	2.01640	0.30459
		NH_4I	1.34400	0.12841	0.74403	$\bar{1}.87159$
	AgBr	NH_4Br	0.52166	$\bar{1}.71739$	1.91690	0.28261
	AgCl	NH_4Cl	0.37323	$\bar{1}.57198$	2.67930	0.42802
	AgI	NH_4I	0.61752	$\bar{1}.79065$	1.61940	0.20935
	$BaSO_4$	$(NH_4)_2SO_4$	0.56613	$\bar{1}.75292$	1.76630	0.24708
	Br	NH_4Br	1.22580	0.08843	0.81577	$\bar{1}.91157$
	Cl	NH_4	0.50874	$\bar{1}.70650$	1.96560	0.29350
		NH_4Cl	1.50870	0.17861	0.66281	$\bar{1}.82139$
	HCl	NH_4Cl	1.46690	0.16641	0.68169	$\bar{1}.83359$
	I	NH_4I	1.1425	0.05782	0.87535	$\bar{1}.94218$
	$MgNH_4PO_4.6H_2O$	NH_3	0.06936	$\bar{2}.84116$	14.4160	$\bar{1}.15884$
		NH_4	0.07347	$\bar{2}.86619$	13.6085	$\bar{1}.13381$
		$(NH_4)_2O$	0.10607	$\bar{1}.02559$	9.42787	0.97441
	N	NH_3	1.21530	0.08477	0.82268	$\bar{1}.91523$
		NH_4	1.28770	0.10980	0.77660	$\bar{1}.89020$
		NH_4Cl	3.81870	0.58191	0.26187	$\bar{1}.41809$
		$(NH_4)_2O$	1.85870	0.26920	0.53802	$\bar{1}.73080$
		$(NH_4)_2SO_4$	4.71620	0.67359	0.21203	$\bar{1}.32641$

A	Weighed or Found.	Required.	A		B	
B	Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Ammonium						
	NH_3	$(NH_4)_2CO_3$	2.8201	0.45026	0.35460	$\bar{1}$.54974
		NH_4HCO_3	4.6419	0.66669	0.21543	$\bar{1}$.33331
		NH_4NO_3	4.7005	0.67215	0.21274	$\bar{1}$.32785
		$(NH_4)_2O$	1.5286	0.18430	0.65418	$\bar{1}$.81570
		NH_4OH	2.0582	0.31348	0.48587	$\bar{1}$.68652
		$(NH_4)_2SO_4$	3.8787	0.58869	0.25782	$\bar{1}$.41131
	NH_4Cl	NH_3	0.31831	$\bar{1}$.50286	3.14150	0.49714
		NH_4	0.33720	$\bar{1}$.52789	2.96560	0.47211
		$(NH_4)_2O$	0.48673	$\bar{1}$.68729	2.05450	0.31271
		NH_4OH	0.65516	$\bar{1}$.81634	1.52640	0.18366
	$(NH_4)_2PtCl_6$	NH_3	0.07670	$\bar{2}$.88482	13.0372	1.11518
		NH_4	0.08126	$\bar{2}$.90985	12.3068	1.09015
		NH_4Cl	0.24097	$\bar{1}$.38196	4.14995	0.61804
		NH_4NO_3	0.36054	$\bar{1}$.55697	2.77351	0.44303
		$(NH_4)_2O$	0.11721	$\bar{1}$.06925	8.52600	0.93075
		NH_4OH	0.15787	$\bar{1}$.19830	6.33429	0.80170
		$(NH_4)_2SO_4$	0.29761	$\bar{1}$.47364	3.36016	0.52636
	N_2O_5	NH_3	0.31531	$\bar{1}$.49874	3.17140	0.50126
		NH_4NO_3	1.48210	0.17089	0.67470	$\bar{1}$.82911
		$(NH_4)_2O$	0.48214	$\bar{1}$.68317	2.07410	0.31683
	Pt	NH_3	0.17449	$\bar{1}$.24176	5.73113	0.75824
		NH_4	0.18484	$\bar{1}$.26679	5.41013	0.73321
		NH_4Cl	0.54815	$\bar{1}$.73890	1.82429	0.26110
		NH_4NO_3	0.82018	$\bar{1}$.91391	1.21925	0.08609
		$(NH_4)_2O$	0.26680	$\bar{1}$.42619	3.74886	0.57381
		NH_4OH	0.35912	$\bar{1}$.55524	2.78458	0.44476
		$(NH_4)_2SO_4$	0.67698	$\bar{1}$.83058	1.47716	0.16942
	SO_3	NH_3	0.42550	$\bar{1}$.62890	2.35020	0.37110
		$(NH_4)_2SO_4$	1.65040	0.21759	0.60591	$\bar{1}$.78241
Antimony, Sb = 120.2						
	Sb	Sb_2O_3	1.19970	0.07907	0.83355	$\bar{1}$.92093
		Sb_2O_5	1.33280	0.12476	0.75031	$\bar{1}$.87524
		$KSbOC_4H_4O_6.\frac{1}{2}H_2O$	2.76490	0.44168	0.36168	$\bar{1}$.55832
	Sb_2O_3	Sb_2O_5	1.1109	0.04569	0.90014	$\bar{1}$.95431
		Sb_2S_5	1.38950	0.14287	0.71966	$\bar{1}$.85713
		$KSbOC_4H_4O_6.\frac{1}{2}H_2O$	2.30470	0.36261	0.43390	$\bar{1}$.63739
	Sb_2O_4	Sb	0.78975	$\bar{1}$.89749	1.26623	0.10251
		Sb_2O_3	0.94746	$\bar{1}$.97656	1.05550	0.02344
		Sb_2O_5	1.05256	0.02225	0.95006	$\bar{1}$.97775
		Sb_2S_3	1.10580	0.04368	0.90431	$\bar{1}$.95632

A Weighed or Found.	Required.	A Factor.	A Logarithm.	B Factor.	B Logarithm.
B Required.	Weighed or Found.				
Antimony					
Sb_2O_4..........	Sb_2S_5.............	1.31650	0.11943	0.75952	$\bar{1}$.88057
	$KSbOC_4H_4O_6 \cdot \frac{1}{2}H_2O$	2.1886	0.33917	0.45796	$\bar{1}$.66083
Sb_2O_5..........	Sb_2S_5.............	1.2507	0.09718	0.79949	$\bar{1}$.90282
Sb_2S_3..........	Sb...............	0.71419	$\bar{1}$.85381	1.40010	0.14619
	Sb_2O_3.............	0.8568	$\bar{1}$.93288	1.16720	0.06712
	Sb_2O_5.............	0.95185	$\bar{1}$.97857	1.05060	0.02143
	$KSbOC_4H_4O_6 \cdot \frac{1}{2}H_2O$	1.97460	0.29548	0.50643	$\bar{1}$.70452
Sb_2S_5..........	Sb...............	0.59987	$\bar{1}$.77806	1.66710	0.22194
Arsenic, As=75					
As_2O_3..........	As...............	0.75748	$\bar{1}$.87937	1.3202	0.12063
	As_2O_5.............	1.16164	0.06508	0.86083	$\bar{1}$.93492
As_2O_5..........	As...............	0.65203	$\bar{1}$.81429	1.5336	0.18571
As_2S_3..........	As...............	0.60911	$\bar{1}$.78470	1.64170	0.21530
	As_2O_3.............	0.80293	$\bar{1}$.90467	1.24545	0.09533
	As_2O_5.............	0.93414	$\bar{1}$.97041	1.07050	0.02959
	As_2S_5.............	1.26062	0.10058	0.79327	$\bar{1}$.89942
As_2S_5..........	As...............	0.48309	$\bar{1}$.68402	2.06985	0.31588
	As_2O_3.............	0.63790	$\bar{1}$.80475	1.56770	0.19526
	As_2O_5.............	0.74101	$\bar{1}$.86983	1.34947	0.13017
$BaSO_4$..........	As...............	0.21408	$\bar{1}$.33060	4.6709	0.66940
	As_2O_3.............	0.28264	$\bar{1}$.45123	3.5381	0.54877
	As_2O_5.............	0.32833	$\bar{1}$.51631	3.04565	0.48369
	AsO_3.............	0.35116	$\bar{1}$.54553	2.8482	0.45457
	AsO_4.............	0.39688	$\bar{1}$.59866	2.51965	0.40134
$MgNH_4AsO_4 \cdot \frac{1}{2}H_2O$	As...............	0.39383	$\bar{1}$.59532	2.5391	0.40468
	As_2O_3.............	0.51993	$\bar{1}$.71595	1.9227	0.28405
	AsO_3.............	0.64603	$\bar{1}$.81025	1.5479	0.18975
	As_2O_5.............	0.60399	$\bar{1}$.78103	1.65563	0.21897
	AsO_4.............	0.72993	$\bar{1}$.86328	1.370	0.13672
$Mg_2As_2O_7$.......	As...............	0.48273	$\bar{1}$.68371	2.07154	0.31629
	As_2O_3.............	0.63730	$\bar{1}$.80435	1.5691	0.19565
	AsO_3.............	0.79183	$\bar{1}$.89864	1.26290	0.10136
	As_2O_5.............	0.74033	$\bar{1}$.86943	1.3504	0.13057
	AsO_4.............	0.89490	$\bar{1}$.95177	1.11745	0.04823
	As_2S_3.............	0.79253	$\bar{1}$.89902	1.26176	0.10098
Barium, Ba=137.37					
$BaCO_3$..........	Ba...............	0.69611	$\bar{1}$.84261	1.43680	0.15739
	$Ba(HCO_3)_2$........	1.31420	0.11867	0.76090	$\bar{1}$.88133

A	Weighed or Found.	Required.	A		B	
B	Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Barium						
	$BaCO_3$	$BaCl_2$	1.05510	0.02339	0.94757	$\bar{1}.97661$
		BaO	0.77707	$\bar{1}.89046$	1.28690	0.10954
	$BaCrO_4$	Ba	0.54195	$\bar{1}.73396$	1.84570	0.26604
		$BaCl_2$	0.82175	$\bar{1}.91474$	1.21700	0.08526
		$BaCO_3$	0.77866	$\bar{1}.89135$	1.28420	0.10865
		BaO	0.60507	$\bar{1}.78181$	1.65260	0.21819
	$BaSiF_6$	Ba	0.49118	$\bar{1}.69124$	2.03590	0.30876
		BaF_2	0.62705	$\bar{1}.73909$	1.59480	0.20270
		BaO	0.54839	$\bar{1}.79730$	1.82350	0.26091
	$BaSO_4$	Ba	0.58851	$\bar{1}.76975$	1.70100	0.23025
		$BaCl_2$	0.89234	$\bar{1}.95054$	1.12070	0.04947
		$BaCl_2.2H_2O$	1.04660	0.01982	0.95539	$\bar{1}.98018$
		$BaCO_3$	0.84555	$\bar{1}.92714$	1.18270	0.07286
		$Ba(NO_3)_2$	1.19180	0.04915	0.89299	$\bar{1}.95085$
		BaO	0.65705	$\bar{1}.81760$	1.52190	0.18240
		BaO_2	0.72560	$\bar{1}.86070$	1.37820	0.13930
		BaS	0.72589	$\bar{1}.86087$	1.37760	0.13913
	CO_2	BaO	3.48570	0.54229	0.28689	$\bar{1}.45771$
		$BaCO_3$	4.48570	0.65183	0.22293	$\bar{1}.34817$
Beryllium, Be = 9.1 See Glucinum						
Bismuth, Bi = 208.0						
	Bi	Bi_2O_3	1.11540	0.04743	0.89654	$\bar{1}.95257$
	$BiAsO_4$	Bi	0.59948	$\bar{1}.77778$	1.66808	0.22222
		Bi_2O_3	0.66866	$\bar{1}.82521$	1.49552	0.17479
	Bi_2O_3	Bi	0.89654	$\bar{1}.95257$	1.11540	0.04743
		$BiONO_3$	1.23280	0.09090	0.81115	$\bar{1}.90910$
		$Bi(NO_3)_3.5H_2O$	2.08670	0.31946	0.47922	$\bar{1}.68054$
	BiOCl	Bi	0.80166	$\bar{1}.90399$	1.24740	0.09601
		$BiONO_3$	1.10240	0.04232	0.90715	$\bar{1}.95768$
		$Bi(NO_3)_3.5H_2O$	1.86580	0.27088	0.53594	$\bar{1}.72912$
		Bi_2O_3	0.89417	$\bar{1}.95142$	1.11840	0.04858
	Bi_2S_3	Bi	0.81215	$\bar{1}.90964$	1.23130	0.09036
		Bi_2O_3	0.90588	$\bar{1}.95707$	1.10390	0.04293
Boron, B = 11						
	B_2O_3	B	0.31428	$\bar{1}.49732$	3.18186	0.50268
		H_3BO_3	1.77212	0.24849	0.56430	$\bar{1}.75151$
		$Na_2B_4O_7.10H_2O$	2.72970	0.43612	0.36634	$\bar{1}$.[illegible]
	KBF_4	B	0.08723	$\bar{2}.94067$	11.4640	[illegible]
		B_2O_3	0.27755	$\bar{1}.44335$	3.60290	[illegible]

A: Weighed or Found.	A: Required.	A		B	
B: Required.	B: Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Boron, B = 11					
KBF_4	H_3BO_3	0.49186	$\bar{1}.69184$	2.03310	0.30816
	$Na_2B_4O_7.10H_2O$	0.75765	$\bar{1}.87947$	1.31990	0.12053
Bromine, Br = 79.92					
Ag	Br	0.74083	$\bar{1}.86972$	1.34980	0.13028
	BrO_3	1.18580	0.07400	0.84333	$\bar{1}.92600$
	HBr	0.75053	$\bar{1}.87537$	1.33240	0.12463
AgBr	Br	0.42556	$\bar{1}.62896$	2.34980	0.37104
	BrO_3	0.68114	$\bar{1}.83324$	1.46810	0.16676
	HBr	0.43113	$\bar{1}.63461$	2.31950	0.36539
Br	O	0.10009	$\bar{1}.00038$	9.99130	0.99962
Cadmium, Cd = 112.4					
Cd	$CdCl_2$	1.63077	0.21239	0.61321	$\bar{1}.78761$
	$Cd(NO_3)_2$	2.10340	0.32292	0.47543	$\bar{1}.67708$
CdO	Cd	0.87539	$\bar{1}.94220$	1.14260	0.05780
	$CdCl_2$	1.42760	0.15459	0.70051	$\bar{1}.84541$
	$Cd(NO_3)_2$	1.84130	0.26512	0.54310	$\bar{1}.73488$
CdS	Cd	0.77802	$\bar{1}.89099$	1.28530	0.10901
	$CdCl_2$	1.26870	0.10338	0.78817	$\bar{1}.89662$
	$Cd(NO_3)_2$	1.63640	0.21391	0.61107	$\bar{1}.78609$
	CdO	0.88884	$\bar{1}.94879$	1.12508	0.05121
$CdSO_4$	Cd	0.53916	$\bar{1}.73172$	1.85470	0.26828
	$CdCl_2$	0.87924	$\bar{1}.94411$	1.13730	0.05589
	$Cd(NO_3)_2$	1.13411	0.05464	0.88178	$\bar{1}.94536$
	CdO	0.61592	$\bar{1}.78952$	1.62360	0.21048
Caesium, Cs = 132.81					
AgCl	CsCl	1.17390	0.06964	0.85185	$\bar{1}.93036$
Cl	Cs	3.74540	0.57349	0.26700	$\bar{1}.42651$
	CsCl	4.74540	0.67627	0.21073	$\bar{1}.32373$
Cs	CsCl	1.26700	0.10278	0.78926	$\bar{1}.89722$
	Cs_2CO_3	1.22580	0.08845	0.81573	$\bar{1}.91155$
	Cs_2O	1.06020	0.02540	0.94319	$\bar{1}.97460$
Cs_2O	CsCl	1.19500	0.07738	0.83680	$\bar{1}.92262$
	Cs_2SO_4	1.28430	0.10868	0.77861	$\bar{1}.89132$
Cs_2PtCl_6	Cs	0.39434	$\bar{1}.59587$	2.53588	0.40413
	CsCl	0.49963	$\bar{1}.69865$	2.00146	0.30135
	Cs_2CO_3	0.48341	$\bar{1}.68432$	2.06862	0.31568
	Cs_2O	0.41809	$\bar{1}.62127$	2.39194	0.37873
[illegible]	Cs	0.73437	$\bar{1}.86592$	1.36170	0.13408

A: Weighed or Found. / B: Required.	A: Required. / B: Weighed or Found.	A Factor.	A Logarithm.	B Factor.	B Logarithm.
Caesium					
Cs_2SO_4	CsCl	0.93046	$\bar{1}$.96870	1.07470	0.03130
	Cs_2CO_3	0.90027	$\bar{1}$.95437	1.11080	0.04563
	Cs_2O	0.77861	$\bar{1}$.89132	1.28430	0.10868
SO_3	Cs_2O	3.51710	0.54619	0.28433	$\bar{1}$.45381
Calcium, Ca = 40.07					
$BaSO_4$	CaS	0.30906	$\bar{1}$.49004	3.23568	0.50996
	$CaSO_4$	0.58323	$\bar{1}$.76584	1.71459	0.23416
	$CaSO_4.2H_2O$	0.73785	$\bar{1}$.86781	1.35578	0.13219
Ca	$CaCl_2$	2.76989	0.44246	0.36103	$\bar{1}$.55754
	CaO	1.39929	0.14591	0.714600	$\bar{1}$.85406
$CaCO_3$	Ca	0.40043	$\bar{1}$.60252	2.49740	0.39748
	$CaCl_2$	1.10913	0.04498	0.90162	$\bar{1}$.95502
	$Ca(HCO_3)_2$	1.61975	0.20945	0.61737	$\bar{1}$.79055
	CaO	0.56031	$\bar{1}$.74843	1.78470	0.25157
	$CaSO_4$	1.36019	0.13360	0.73517	$\bar{1}$.86640
	$CaSO_4.2H_2O$	1.72048	0.23565	0.58123	$\bar{1}$.76435
	HCl	0.72890	$\bar{1}$.86267	1.37192	0.13733
CaO	Ca	0.71465	$\bar{1}$.85409	1.39929	0.14591
	$CaCl_2$	1.97932	0.29652	0.50518	$\bar{1}$.70345
	$CaCO_3$	1.78470	0.25157	0.56031	$\bar{1}$.74843
	$Ca(HCO_3)_2$	2.89080	0.46102	0.34592	$\bar{1}$.53898
	$CaSO_4$	2.42800	0.38525	0.41186	$\bar{1}$.61475
	$CaSO_4.2H_2O$	3.07057	0.48722	0.32582	$\bar{1}$.51298
$Ca_3(PO_4)_2$	CaO	0.54209	$\bar{1}$.73407	1.84490	0.26593
	$CaSO_4$	1.31618	0.11932	0.75977	$\bar{1}$.88068
$CaSO_4$	Ca	0.29434	$\bar{1}$.46884	3.39747	0.53116
	$CaCl_2$	0.81528	$\bar{1}$.91130	1.22659	0.08870
	$CaCO_3$	0.73519	$\bar{1}$.86640	1.36019	0.13360
	CaF_2	0.57345	$\bar{1}$.75850	1.74380	0.24150
	CaO	0.41186	$\bar{1}$.61475	2.42800	0.38525
Cl	Ca	0.56500	$\bar{1}$.75205	1.76990	0.24795
	$CaCl_2$	1.56500	0.19451	0.63899	$\bar{1}$.80549
	CaO	0.79060	$\bar{1}$.89796	1.26485	0.10204
CO_2	CaO	1.27432	0.10528	0.78487	$\bar{1}$.89480
	$CaCO_3$	2.27431	0.35685	0.43969	$\bar{1}$.64315
$Mg_2As_2O_7$	$Ca_3(AsO_4)_2$	1.28212	0.10793	0.77995	$\bar{1}$.89207
MgO	CaO	1.39064	0.14321	0.719100	$\bar{1}$.85679
$Mg_2P_2O_7$	$Ca_3(PO_4)_2$	1.39323	0.14402	0.71777	$\bar{1}$.85598
$(NH_4)_3PO_4.12MoO_3$	$Ca_3(PO_4)_2$	0.08265	$\bar{2}$.91725	12.0989	1.08275
N_2O_5	$Ca(NO_3)_2$	1.51907	0.18158	0.65830	$\bar{1}$.81842

A: Weighed or Found. / B: Required.	Required. / Weighed or Found.	A Factor.	A Logarithm.	B Factor.	B Logarithm.
Calcium					
P_2O_5	$Ca_3(PO_4)_2$	2.18400	0.33925	0.45787	$\bar{1}$.66075
SO_3	CaO	0.70026	$\bar{1}$.84526	1.42803	0.15474
	$CaSO_4$	1.70031	0.23053	0.58813	$\bar{1}$.76947
	$CaSO_4.2H_2O$	2.15020	0.33248	0.46520	$\bar{1}$.66764
WO_3	$CaWO_4$	1.24180	0.09404	0.80530	$\bar{1}$.90596
Carbon, C=12.00					
Ag	HCN	0.25061	$\bar{1}$.39920	3.99027	0.60080
	KCN	0.60354	$\bar{1}$.78071	1.65680	0.21929
AgCN	HCN	0.20202	$\bar{1}$.30539	4.95000	0.69461
	KCN	0.48630	0.68690	2.05640	0.31310
$BaCO_3$	C	0.06080	$\bar{2}$.78390	16.4480	1.21610
	CO_2	0.22293	$\bar{1}$.34817	4.48570	0.65183
	CO_3	0.30400	$\bar{1}$.48287	3.28950	0.51713
BaO	CO_2	0.28689	$\bar{1}$.45771	3.48570	0.54229
	CO_2 (bicarbonate)	0.57377	$\bar{1}$.75874	1.74280	0.24126
CaO	CO_2	0.78487	$\bar{1}$.89480	1.27432	0.10528
	CO_2 (bicarbonate)	1.56973	0.19575	0.63716	$\bar{1}$.80425
CO_2	$BaCO_3$	4.48570	0.65183	0.22293	$\bar{1}$.34817
	$Ba(HCO_3)_2$	2.94760	0.46947	0.33925	$\bar{1}$.53053
	C	0.27273	$\bar{1}$.43573	3.66676	0.56427
	$CaCO_3$	2.27431	0.35685	0.43969	$\bar{1}$.64315
	$Ca(HCO_3)_2$	1.84151	0.26517	0.54291	$\bar{1}$.73473
	CO_3	1.36365	0.13470	0.73333	$\bar{1}$.86530
	Cs_2CO_3	7.40050	0.86926	0.13512	$\bar{1}$.13074
	$CsHCO_3$	4.40490	0.64394	0.22702	$\bar{1}$.35606
	$FeCO_3$	2.63273	0.42041	0.37983	$\bar{1}$.57959
	$Fe(HCO_3)_2$	2.02111	0.30560	0.49477	$\bar{1}$.69440
	K_2CO_3	3.14090	0.49706	0.31838	$\bar{1}$.50294
	$KHCO_3$	2.27520	0.35702	0.43952	$\bar{1}$.64298
	K_2O	2.14090	0.33060	0.46709	$\bar{1}$.66940
	Li_2CO_3	1.67912	0.22508	0.59468	$\bar{1}$.77492
	$LiHCO_3$	1.54432	0.18874	0.64753	$\bar{1}$.81126
	Li_2O	0.67910	$\bar{1}$.83193	1.47254	0.16807
	$MgCO_3$	1.91640	0.28248	0.52182	$\bar{1}$.71752
	$Mg(HCO_3)_2$	1.66290	0.22088	0.60134	$\bar{1}$.77912
	MgO	0.91637	$\bar{1}$.96207	1.09130	0.03793
	$MnCO_3$	2.61210	0.41698	0.38284	$\bar{1}$.58302
	$Mn(HCO_3)_2$	2.01080	0.30337	0.49731	$\bar{1}$.69663
	MnO	1.61210	0.20738	0.62033	$\bar{1}$.79262

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Carbon					
CO_2	Na_2CO_3	2.40910	0.38186	0.41509	$\bar{1}.61814$
	$NaHCO_3$	1.90930	0.28087	0.52376	$\bar{1}.71913$
	Na_2O	1.40910	0.14894	0.70968	$\bar{1}.85106$
	$(NH_4)_2CO_3$	2.18360	0.33918	0.45795	$\bar{1}.66082$
	NH_4HCO_3	1.79660	0.25445	0.55660	$\bar{1}.74555$
	Pb_3CO_3	6.07050	0.78322	0.16473	$\bar{1}.21678$
	Rb_2CO_3	5.24770	0.71997	0.19056	$\bar{1}.28003$
	$RbHCO_3$	3.32730	0.52209	0.30055	$\bar{1}.47791$
	Rb_2O	4.24780	0.62816	0.23542	$\bar{1}.37184$
	$SrCO_3$	3.35523	0.52572	0.29804	$\bar{1}.47428$
	$Sr(HCO_3)_2$	2.38230	0.37699	0.41977	$\bar{1}.62301$
	SrO	2.35533	0.37205	0.42457	$\bar{1}.62795$
Cerium, $Ce = 140.25$					
Ce	$Ce(NO_3)_4$	2.76850	0.44225	0.36120	$\bar{1}.55775$
	$Ce(NO_3)_4 (NH_4NO_3)_2.H_2O$	4.03870	0.60624	0.24760	$\bar{1}.39376$
	Ce_2O_3	1.17114	0.06861	0.85387	$\bar{1}.93139$
	CeO_2	1.22820	0.08926	0.81421	$\bar{1}.91074$
	$Ce(SO_4)_3$	2.02750	0.30696	0.49322	$\bar{1}.69304$
Ce_2O_3	$Ce(NO_3)_4$	2.36390	0.37364	0.42302	$\bar{1}.62636$
	$Ce(NO_3)_4 (NH_4NO_3)_2.H_2O$	3.44850	0.53763	0.28998	$\bar{1}.46237$
	CeO_2	1.04870	0.02065	0.95356	$\bar{1}.97935$
	$Ce_2(SO_4)_3$	1.73120	0.23835	0.57763	$\bar{1}.76165$
CeO_2	$Ce(NO_3)_4$	2.25420	0.35299	0.44362	$\bar{1}.64701$
	$Ce(NO_3)_4 (NH_4NO_3)_2.H_2O$	3.28840	0.51698	0.30401	$\bar{1}.48302$
$Ce_2(C_2O_4)_3.3H_2O$	$Ce_2(SO_4)_3$	1.65080	0.21770	0.60576	$\bar{1}.78230$
	Ce	0.46863	$\bar{1}.67083$	2.13380	0.32917
Chlorine, $Cl = 35.46$					
Ag	Cl	0.32870	$\bar{1}.51680$	3.04230	0.48320
	HCl	0.33796	$\bar{1}.52886$	2.95900	0.47114
$AgCl$	Cl	0.24738	$\bar{1}.39337$	4.04230	0.60663
	HCl	0.25435	$\bar{1}.40543$	3.93160	0.59457
$BaCrO_4$	Cl	0.27988	$\bar{1}.44697$	3.57300	0.55303
Ca	Cl	1.76990	0.24795	0.56500	$\bar{1}.75205$
K	Cl	0.90691	$\bar{1}.95756$	1.10270	0.04244
KCl	Cl	0.47558	$\bar{1}.67723$	2.10260	0.32277
Li	Cl	5.10947	0.70838	0.19579	$\bar{1}.29162$
Mg	Cl	2.91620	0.46481	0.34292	$\bar{1}.53519$
$MgCl_2$	Cl	0.74465	$\bar{1}.87195$	1.34300	0.12805
MnO_2	Cl	0.81583	$\bar{1}.91160$	1.22570	0.08840

A — Weighed or Found.	Required.	A		B	
B — Required.	**Weighed or Found.**	**Factor.**	**Logarithm.**	**Factor.**	**Logarithm.**
Chlorine					
Na	Cl	1.54170	0.18801	0.64862	$\bar{1}$.81199
NaCl	Cl	0.60657	$\bar{1}$.78288	1.64860	0.21712
NH_4	Cl	1.96560	0.29350	0.50874	$\bar{1}$.70650
NH_4Cl	HCl	0.68169	$\bar{1}$.83359	1.46690	0.16641
$(NH_4)_2SO_4$	HCl	0.55196	$\bar{1}$.74191	1.81170	0.25809
$PbCrO_4$	Cl	0.21950	$\bar{1}$.34143	4.55584	0.65857
Chromium, Cr = 52.0					
$BaCrO_4$	Cr	0.20529	$\bar{1}$.31236	4.87122	0.68764
	Cr_2O_3	0.29992	$\bar{1}$.47707	3.33389	0.52293
	CrO_3	0.39469	$\bar{1}$.59626	2.53359	0.40374
	CrO_4	0.45784	$\bar{1}$.66072	2.18415	0.33928
	$Cr_2(SO_4)_3.18H_2O$	1.41400	0.15045	0.70722	$\bar{1}$.84955
Cr_2O_3	Cr	0.68422	$\bar{1}$.83519	1.46154	0.16481
	CrO_3	1.31570	0.11919	0.76000	$\bar{1}$.88081
K_2CrO_4	CrO_3	0.51494	$\bar{1}$.71175	1.94200	0.28825
$K_2Cr_2O_7$	CrO_3	0.68028	$\bar{1}$.83269	1.46930	0.16731
$PbCrO_4$	Cr	0.16094	$\bar{1}$.20666	6.21357	0.79334
	Cr_2O_3	0.23522	$\bar{1}$.37147	4.25139	0.62853
	CrO_3	0.30950	$\bar{1}$.49066	3.23100	0.50934
	CrO_4	0.35902	$\bar{1}$.55512	2.78532	0.44488
	$Cr_2(SO_4)_3.18H_2O$	1.10879	0.04485	0.90188	$\bar{1}$.95515
	K_2CrO_4	0.60106	$\bar{1}$.77891	1.66377	0.22109
	$K_2Cr_2O_7$	0.45495	$\bar{1}$.65797	2.19800	0.34203
Cobalt, Co = 58.97					
Co	CoO	1.27140	0.10426	0.78657	$\bar{1}$.89574
	$Co(NO_3)_2.6H_2O$	4.93610	0.69339	0.20258	$\bar{1}$.30661
	$CoSO_4.7H_2O$	4.76770	0.67831	0.20974	$\bar{1}$.32169
$Co(NO_2)_3(KNO_2)_3$	Co	0.13037	$\bar{1}$.11517	7.67060	0.88483
	CoO	0.16574	$\bar{1}$.21943	6.03350	0.78057
Co_3O_4	Co	0.73433	$\bar{1}$.86589	1.36180	0.13411
	CoO	0.93358	$\bar{1}$.97015	1.07110	0.02985
$CoSO_4$	Co	0.38036	$\bar{1}$.58019	2.62920	0.41981
	CoO	0.48356	$\bar{1}$.68445	2.06800	0.31555
$(CoSO_4)_2(K_2SO_4)_3$	Co	0.14160	$\bar{1}$.15107	7.06200	0.84893
[93.5	CoO	0.18002	$\bar{1}$.25533	5.55480	0.74467
Columbium, Cb =					
Cb_2O_5	Cb	0.70038	$\bar{1}$.84533	1.42780	0.15467
Copper, Cu = 63.57					
Cu	CuO	1.25170	0.09750	0.79891	$\bar{1}$.90250

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		Factor.	Logarithm.	Factor.	Logarithm.
Copper					
Cu	$CuSO_4.5H_2O$	3.92830	0.59420	0.25457	$\bar{1}.40580$
	$Cu_2\left\{\begin{matrix}C_2H_3O_2\\(AsO_2)_3\end{matrix}\right\}$	3.98800	0.60076	0.25075	$\bar{1}.39924$
CuCNS	Cu	0.52257	$\bar{1}.71814$	1.91370	0.28186
	CuO	0.65409	$\bar{1}.81564$	1.52880	0.18436
CuO	Cu	0.79891	$\bar{1}.90250$	1.25170	0.09750
	$CuSO_4.5H_2O$	3.13830	0.49670	0.31864	$\bar{1}.50330$
Cu_2O	Cu	0.88824	$\bar{1}.94853$	1.12580	0.05147
Cu_2S	Cu	0.79859	$\bar{1}.90232$	1.25220	0.09768
	CuO	0.99956	$\bar{1}.99981$	1.00040	0.00019
	Cu_2O	0.89907	$\bar{1}.95379$	1.11220	0.04621
	$CuSO_4.5H_2O$	1.56850	0.19548	0.63756	$\bar{1}.80452$
$Mg_2As_2O_7$	$Cu_2\left\{\begin{matrix}C_2H_3O_2\\(AsO_2)_3\end{matrix}\right\}$	1.08845	0.03681	0.91874	$\bar{1}.96319$
Erbium, Er=167.4					
Er_2O_3	Er	0.87462	$\bar{1}.94182$	1.14330	0.05818
Fluorine, F=19					
$BaSiF_6$	BaF_2	0.62705	$\bar{1}.79730$	1.59480	0.20270
	F	0.40762	$\bar{1}.61025$	2.45330	0.38975
	HF	0.42924	$\bar{1}.63270$	2.32970	0.36730
	H_2SiF_6	0.51602	$\bar{1}.71267$	1.93790	0.28733
	SiF_4	0.37294	$\bar{1}.57163$	2.68140	0.42837
	SiF_6	0.50880	$\bar{1}.70655$	1.96540	0.29345
CaF_2	F	0.48675	$\bar{1}.68730$	2.05447	0.31270
	HF	0.51258	$\bar{1}.70976$	1.95091	0.29024
	H_2SiF_6	1.62283	0.21028	0.61620	$\bar{1}.78972$
$CaSO_4$	F	0.27913	$\bar{1}.44580$	3.58258	0.55420
	HF	0.29394	$\bar{1}.46826$	3.40208	0.53174
K_2SiF_6	F	0.51700	$\bar{1}.71349$	1.93420	0.28651
	HF	0.54443	$\bar{1}.73594$	1.83680	0.26406
	H_2SiF_6	0.65451	$\bar{1}.81591$	1.52790	0.18409
	KF	0.52699	$\bar{1}.72180$	1.89760	0.27820
	SiF_6	0.64534	$\bar{1}.80979$	1.54950	0.19021
H_2SiF_6	F	0.78992	$\bar{1}.89758$	1.26600	0.10242
	2HF	0.27728	$\bar{1}.44292$	3.60650	0.55708
	6HF	0.83182	$\bar{1}.92003$	1.20220	0.07997
	SiF_4	0.72270	$\bar{1}.85896$	1.38370	0.14104
	SiF_6	0.98601	$\bar{1}.99388$	1.01410	0.00612
Gallium, Ga=69.9					
Ga_2O_3	Ga	0.74441	$\bar{1}.87181$	1.34340	0.12819
Ga_2S_3	Ga	0.59235	$\bar{1}.77258$	1.68820	0.22742

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B — Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Germanium, Ge = 72.5					
GeO_2	Ge	0.69378	$\bar{1}.84122$	1.44140	0.15878
K_2GeF_6	Ge	0.27390	$\bar{1}.43759$	3.65100	0.56241
Glucinum, Gl = 9.1					
GlO	Gl	0.36255	$\bar{1}.55937$	2.75820	0.44063
	$GlCl_2$	3.18810	0.50353	0.31367	$\bar{1}.49647$
	$GlSO_4.4H_2O$	7.06070	0.84885	0.14163	$\bar{1}.15115$
Gold, Au = 197.2					
Au	$AuCl_3$	1.53940	0.18736	0.64959	$\bar{1}.81264$
	$HAuCl_4.4H_2O$	2.08980	0.32010	0.47852	$\bar{1}.67990$
	$KAu(CN)_4.H_2O$	1.81720	0.25941	0.55028	$\bar{1}.74059$
Hydrogen, H = 1.008					
H_2O	H	0.11190	$\bar{1}.04884$	8.93630	0.95116
Indium, In = 114.8					
In_2O_3	In	0.82709	$\bar{1}.91755$	1.20900	0.08245
In_2S_3	In	0.70472	$\bar{1}.84801$	1.41870	0.15199
Iodine, I = 126.92					
Ag	HI	1.18590	0.07403	0.84328	$\bar{1}.92597$
	I	1.17650	0.07059	0.84998	$\bar{1}.92941$
AgI	HI	0.54484	$\bar{1}.73627$	1.83540	0.26373
	I	0.54055	$\bar{1}.73283$	1.85000	0.26717
	IO_3	0.74497	$\bar{1}.87214$	1.34230	0.12786
	IO_4	0.81313	$\bar{1}.91016$	1.22980	0.08984
	I_2O_5	0.71091	$\bar{1}.85181$	1.40670	0.14819
	I_2O_7	0.77904	$\bar{1}.89156$	1.28360	0.10844
Pd	HI	2.39790	0.37984	0.41703	$\bar{1}.62016$
	I	2.37900	0.37640	0.42034	$\bar{1}.62360$
PdI_2	HI	0.70965	$\bar{1}.85104$	1.40920	0.14896
	I	0.70404	$\bar{1}.84760$	1.42040	0.15240
	IO_3	0.97031	$\bar{1}.98691$	1.03060	0.01309
	IO_4	1.05910	0.02493	0.94421	$\bar{1}.97507$
	I_2O_5	0.92593	$\bar{1}.96658$	1.07990	0.03342
	I_2O_7	1.01470	0.00633	0.98553	$\bar{1}.99367$
TlI	HI	0.38658	$\bar{1}.58724$	2.58680	0.41276
	I	0.38353	$\bar{1}.58380$	2.60740	0.41620
	IO_3	0.52858	$\bar{1}.72311$	1.89190	0.27689
	IO_4	0.57694	$\bar{1}.76113$	1.73330	0.23887
	I_2O_5	0.50440	$\bar{1}.70278$	1.98250	0.29722
	I_2O_7	0.55275	$\bar{1}.74253$	1.80910	0.25747
Iron, Fe = 55.84					
Ag	$Fe_7(CN)_{18}$ (Prussian blue)	0.44240	$\bar{1}.64582$	2.26036	0.35418
CN	$Fe_7(CN)_{18}$	1.83492	0.26362	0.54496	$\bar{1}.73637$

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Iron					
CO_2	FeO	1.63300	0.21298	0.61238	$\bar{1}$.78702
	$FeCO_3$	2.63275	0.42041	0.37978	$\bar{1}$.57959
	$Fe(HCO_3)_2$	2.02120	0.30560	0.49477	$\bar{1}$.69440
Fe	$Fe(HCO_3)_2$	3.18514	0.50313	0.31396	$\bar{1}$.49687
	FeO	1.28654	0.10942	0.77727	$\bar{1}$.89058
	Fe_2O_3	1.42981	0.15527	0.69940	$\bar{1}$.84473
	$FeSO_4$	2.72044	0.43464	0.36758	$\bar{1}$.56536
	$FeSO_4.7H_2O$	4.97911	0.69715	0.20083	$\bar{1}$.30285
	$FeSO_4.(NH_4)_2SO_4.6H_2O$	7.02281	0.84651	0.14239	$\bar{1}$.15349
FeO	Fe	0.77728	$\bar{1}$.89058	1.28656	0.10942
	$FeCO_3$	1.61244	0.20749	0.62017	$\bar{1}$.79251
	$Fe(HCO_3)_2$	2.47577	0.39371	0.40392	$\bar{1}$.60629
	Fe_2O_3	1.11136	0.04585	0.89980	$\bar{1}$.95415
Fe_2O_3	Fe	0.69940	$\bar{1}$.84473	1.42977	0.15527
	$FeCl_3$	2.03181	0.30788	0.49211	$\bar{1}$.69212
	$FeCO_3$	1.45090	0.16164	0.68924	$\bar{1}$.83836
	$Fe(HCO_3)_2$	2.22777	0.34786	0.44889	$\bar{1}$.65214
	FeO	0.89980	$\bar{1}$.95415	1.11136	0.04585
	Fe_3O_4	0.96657	$\bar{1}$.98523	1.03460	0.01477
	$FeSO_4$	1.90270	0.27937	0.52556	$\bar{1}$.72063
	$FeSO_4.7H_2O$	3.48224	0.54186	0.28717	$\bar{1}$.45814
	$FeSO_4.(NH_4)_2SO_4.6H_2O$	4.91177	0.69124	0.20351	$\bar{1}$.30876
	$Fe_2(SO_4)_3$	2.50435	0.39869	0.39940	$\bar{1}$.60131
	$FePO_4$	1.88978	0.27641	0.52920	$\bar{1}$.72362
$FePO_4$	Fe	0.37010	$\bar{1}$.56832	2.70200	0.43168
	FeO	0.47615	$\bar{1}$.67774	2.10019	0.32226
FeS	Fe	0.63463	$\bar{1}$.80252	1.57425	0.19748
	FeO	0.81723	$\bar{1}$.91234	1.22370	0.08766
	Fe_2O_3	0.90820	$\bar{1}$.95819	1.10110	0.04181
$Mg_2As_2O_7$	$FeAsO_4$	1.25423	0.09838	0.79714	$\bar{1}$.90162
SO_3	FeO	0.89722	$\bar{1}$.95290	1.11450	0.04710
	$FeSO_4$	1.89744	0.27812	0.52709	$\bar{1}$.72188
Lanthanum, La = 139.0					
La_2O_3	La	0.85275	$\bar{1}$.93082	1.17270	0.06918
Lead, Pb = 207.1					
Pb	PbO	1.07720	0.03232	0.92828	$\bar{1}$.96768
	$PbCO_3$	1.28970	0.11049	0.77537	$\bar{1}$.88951
	$(PbCO_3)_2Pb(OH)_2$	1.24790	0.09618	0.80135	$\bar{1}$.90382
	$Pb(OH)_2$	1.16430	0.06606	0.85890	$\bar{1}$.93394

A: Weighed or Found.	Required.	A		B	
B: Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Lead					
$PbCl_2$	Pb	0.74492	$\bar{1}.87211$	1.34240	0.12789
	PbO	0.80248	$\bar{1}.90443$	1.24610	0.09557
$PbCrO_4$	Pb	0.64097	$\bar{1}.80684$	1.56011	0.19316
	$Pb(C_2H_3O_2)_2.3H_2O$	1.17362	0.06953	0.85206	$\bar{1}.93047$
	$(PbCO_3)_2Pb(OH)_2$	0.84740	$\bar{1}.92089$	1.19980	0.07911
	PbO	0.68890	$\bar{1}.83816$	1.44823	0.16084
	Pb_3O_4	0.70700	$\bar{1}.84942$	1.41424	0.15058
	$PbSO_4$	0.93832	$\bar{1}.97235$	1.06574	0.02765
PbO	Pb	0.92828	$\bar{1}.96768$	1.07720	0.03232
	$PbCO_3$	1.19720	0.07817	0.83528	$\bar{1}.92183$
	$Pb(NO_3)_2$	1.48420	0.17149	0.67377	$\bar{1}.82851$
PbO_2	Pb	0.86616	$\bar{1}.93760$	1.15450	0.06240
	$Pb(NO_3)_2$	1.38480	0.14141	0.72209	$\bar{1}.85859$
$PbSO_4$	$BaSO_4$	0.76998	$\bar{1}.88648$	1.29880	0.11352
	Pb	0.68311	$\bar{1}.83449$	1.46390	0.16551
	$Pb(C_2H_3O_2)_2.3H_2O$	1.25070	0.09718	0.79947	$\bar{1}.90282$
	$PbCO_3$	0.88101	$\bar{1}.94498$	1.13510	0.05502
	$(PbCO_3)_2Pb(OH)_2$	0.85245	$\bar{1}.93067$	1.17310	0.06933
	$Pb(NO_3)_2$	1.09220	0.03830	0.91559	$\bar{1}.96170$
	PbO	0.73589	$\bar{1}.86681$	1.35890	0.13319
	PbO_2	0.78866	$\bar{1}.89689$	1.26790	0.10311
	Pb_3O_4	0.75348	$\bar{1}.87707$	1.32720	0.12293
PbS	Pb	0.86591	$\bar{1}.93747$	1.15490	0.06253
	PbO	0.93280	$\bar{1}.96979$	1.07200	0.03021
	$PbSO_4$	1.26760	0.10298	0.78890	$\bar{1}.89702$
Lithium, Li = 6.94					
CO_2	Li_2CO_3	1.68123	0.22568	0.59555	$\bar{1}.77492$
	$LiHCO_3$	1.54432	0.18874	0.64753	$\bar{1}.81126$
	Li_2O	0.67910	$\bar{1}.83193$	1.47255	0.16807
LiCl	Li	0.16368	$\bar{1}.21399$	6.10958	0.78601
	Li_2O	0.35227	$\bar{1}.54698$	2.83807	0.45302
Li_2CO_3	Li	0.18789	$\bar{1}.27386$	5.32273	0.72614
	LiCl	1.14785	0.05987	0.87124	$\bar{1}.94013$
	$LiHCO_3$	1.83947	0.26469	0.54366	$\bar{1}.73531$
	Li_2O	0.40444	$\bar{1}.60685$	2.46300	0.39315
$LiHCO_3$	Li_2O	0.21960	$\bar{1}.34216$	4.54821	0.65784
Li_2O	Li	0.46427	$\bar{1}.66678$	2.15389	0.33322
	Li_2SO_4	3.67992	0.56582	0.27176	$\bar{1}.43418$
Li_3PO_4	Li	0.17976	$\bar{1}.25470$	5.56287	0.74530
	LiCl	1.09825	0.04071	0.91052	$\bar{1}.95929$
	Li_2CO_3	0.95689	$\bar{1}.98084$	1.04510	0.01916
	$LiHCO_3$	1.76008	0.24553	0.56815	$\bar{1}.75447$

A Weighed or Found.	Required.	A Factor.	A Logarithm.	B Factor.	B Logarithm.
B Required.	Weighed or Found.				
Lithium					
Li_3PO_4	Li_2O	0.38700	$\bar{1}.58769$	2.58419	0.41231
	Li_2SO_4	1.42400	0.15351	0.70225	$\bar{1}.84649$
	$Li_2SO_4.H_2O$	1.65738	0.21942	0.60337	$\bar{1}.78058$
Li_2SO_4	Li	0.12624	$\bar{1}.10119$	7.92155	0.89881
	LiCl	0.77124	$\bar{1}.88720$	1.29657	0.11280
SO_3	Li_2O	0.37317	$\bar{1}.57191$	2.67974	0.42809
	Li_2SO_4	1.37319	0.13773	0.72823	$\bar{1}.86227$
Magnesium, **Mg** = 24.32					
$BaSO_4$	$MgSO_4$	0.51576	$\bar{1}.71245$	1.93890	0.28755
	$MgSO_4.7H_2O$	1.05600	0.02368	0.94693	$\bar{1}.97632$
Br	Mg	0.15213	$\bar{1}.18222$	6.57320	0.81778
	$MgBr_2$	1.15200	0.06145	0.86806	$\bar{1}.93855$
	$MgBr_2.6H_2O$	1.82820	0.26203	0.54698	$\bar{1}.73797$
Cl	Mg	0.34292	$\bar{1}.53519$	2.91620	0.46481
	$MgCl_2$	1.34300	0.12805	0.74465	$\bar{1}.87195$
	$MgCl_2.6H_2O$	2.86720	0.45746	0.34877	$\bar{1}.54254$
CO_2	$MgCO_3$	1.91640	0.28248	0.52182	$\bar{1}.71752$
	MgO	0.91637	$\bar{1}.96207$	1.09130	0.03793
I	Mg	0.09581	$\bar{2}.98140$	10.4380	1.01860
	MgI_2	1.09580	0.03973	0.91258	$\bar{1}.96027$
Mg	$MgCO_3$	3.46720	0.53997	0.28842	$\bar{1}.46003$
$MgCO_3$	$Mg(HCO_3)_2$	1.73550	0.23943	0.57619	$\bar{1}.76057$
MgO	Mg	0.60317	$\bar{1}.78044$	1.65790	0.21956
	$MgCO_3$	2.09120	0.32041	0.47818	$\bar{1}.67959$
	$Mg(HCO_3)_2$	3.62940	0.55984	0.27553	$\bar{1}.44016$
	$MgSO_4$	2.98590	0.47507	0.33491	$\bar{1}.52493$
$Mg_2P_2O_7$	Mg	0.21839	$\bar{1}.33923$	4.57900	0.66077
	$MgCl_2$	0.85524	$\bar{1}.93209$	1.16924	0.06791
	$MgCl_2.6H_2O$	1.82600	0.26150	0.54765	$\bar{1}.73850$
	$MgCl_2.KCl.6H_2O$	2.49552	0.39716	0.40072	$\bar{1}.60284$
	$MgCO_3$	0.75719	$\bar{1}.87920$	1.32062	0.12080
	$Mg(HCO_3)_2$	1.31406	0.11862	0.76097	$\bar{1}.88137$
	MgO	0.36207	$\bar{1}.55879$	2.76189	0.44121
	$MgSO_4$	1.08110	0.03386	0.92479	$\bar{1}.96604$
	$MgSO_4.7H_2O$	2.21355	0.34509	0.45176	$\bar{1}.65491$
$MgSO_4$	Mg	0.20201	$\bar{1}.30537$	4.94502	0.69463
	MgO	0.33491	$\bar{1}.52493$	2.98590	0.47507
SO_3	MgO	0.50356	$\bar{1}.70205$	1.98580	0.29795
	$MgSO_4$	1.50360	0.17712	0.66509	$\bar{1}.82288$
	$MgSO_4.7H_2O$	3.07860	0.48835	0.32483	$\bar{1}.51165$

A Weighed or Found.	Required.	A		B	
B Required.	**Weighed or Found.**	**Factor.**	**Logarithm.**	**Factor.**	**Logarithm.**
Manganese, $Mn=54.93$					
$BaSO_4$	$MnSO_4$	0.64690	$\bar{1}$.81084	1.54580	0.18916
CO_2	$MnCO_3$	2.61210	0.41698	0.38284	$\bar{1}$.58302
	MnO	1.61210	0.20738	0.62033	$\bar{1}$.79262
Mn	$MnCO_3$	2.09230	0.32062	0.47795	$\bar{1}$.67938
	MnO	1.29130	0.11102	0.77442	$\bar{1}$.88898
	Mn_2O_3	1.43690	0.15744	0.69593	$\bar{1}$.84256
$Mn(HCO_3)_2$	$MnCO_3$	0.64950	$\bar{1}$.81258	1.53970	0.18742
MnO	$MnCO_3$	1.62030	0.20960	0.61716	$\bar{1}$.79040
	$Mn(HCO_3)_2$	2.49470	0.39702	0.40084	$\bar{1}$.60298
	Mn_2O_3	1.11280	0.04641	0.89865	$\bar{1}$.95359
Mn_3O_4	Mn	0.72026	$\bar{1}$.85749	1.38840	0.14251
	$MnCO_3$	1.50700	0.17811	0.66358	$\bar{1}$.82189
	$Mn(HCO_3)_2$	2.32030	0.36553	0.43099	$\bar{1}$.63447
	MnO	0.93006	$\bar{1}$.96851	1.07520	0.03149
	Mn_2O_3	1.03490	0.01492	0.96623	$\bar{1}$.98508
	MnO_2	1.13980	0.05685	0.87730	$\bar{1}$.94315
	$MnSO_4$	1.98000	0.29666	0.50506	$\bar{1}$.70334
$Mn_2P_2O_7$	Mn	0.38691	$\bar{1}$.58761	2.58460	0.41239
	$MnCO_3$	0.80952	$\bar{1}$.90823	1.23528	0.09177
	MnO	0.49961	$\bar{1}$.69863	2.00156	0.30137
	MnO_2	0.61231	$\bar{1}$.78697	1.63315	0.21303
	$MnSO_4$	1.06344	0.02678	0.94020	$\bar{1}$.97322
MnS	Mn	0.63138	$\bar{1}$.80029	1.58380	0.19971
	$MnCO_3$	1.32100	0.12091	0.75699	$\bar{1}$.87909
	MnO	0.81529	$\bar{1}$.91131	1.22660	0.08869
	$MnSO_4$	1.73560	0.23946	0.57615	$\bar{1}$.76054
SO_3	MnO	0.88585	$\bar{1}$.94736	1.12890	0.05264
	$MnSO_4$	1.88580	0.27551	0.53026	$\bar{1}$.72449
Mercury, $Hg=200.6$					
Hg	$HgCl_2$	1.35353	0.13147	0.73880	$\bar{1}$.86853
	HgO	1.07969	0.03330	0.92612	$\bar{1}$.96667
	HgS	1.156825	0.06327	0.86444	$\bar{1}$.93673
HgCl	Hg	0.84978	$\bar{1}$.92931	1.17676	0.07069
	$HgCl_2$	1.15021	0.06078	0.86940	$\bar{1}$.93922
	$HgNO_3$	1.11015	0.04538	0.90078	$\bar{1}$.95462
	Hg_2O	0.88364	$\bar{1}$.94629	1.13165	0.05371
	HgO	0.91756	$\bar{1}$.96264	1.08983	0.03736
	HgS	0.98760	$\bar{1}$.96458	1.01256	0.00542
HgS	$HgCl_2$	1.17002	0.06820	0.85468	$\bar{1}$.93180
	$Hg(CN)_2$	1.08860	0.03687	0.91860	$\bar{1}$.96313

A Weighed or Found.	Required.	A		B	
B Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Mercury,					
HgS	$HgNO_3$	1.12949	0.05282	0.88508	$\bar{1}.94718$
	$Hg(NO_3)_2$	1.39642	0.14502	0.71612	$\bar{1}.85498$
	$Hg(NO_3)_2.H_2O$	1.47400	0.16850	0.67842	$\bar{1}.83150$
	Hg_2O	0.89890	$\bar{1}.95371$	1.11250	0.04629
	HgO	0.93339	$\bar{1}.97006$	1.07138	0.02994
	$HgSO_4$	1.27579	0.10578	0.78382	$\bar{1}.89422$
Molybdenum, Mo = 96.0					
MoO_3	Mo	0.66667	$\bar{1}.82391$	1.50000	0.17609
	$(NH_4)_2MoO_4$	1.36170	0.13408	0.73437	$\bar{1}.86592$
MoS_3	Mo	0.49946	$\bar{1}.69850$	2.00220	0.30150
	MoO_3	0.74919	$\bar{1}.87459$	1.33480	0.12541
	$(NH_4)_2MoO_4$	1.02020	0.00867	0.98024	$\bar{1}.99133$
$(NH_4)_3PO_4(MoO_3)_{12}$	MoO_3	0.92053	$\bar{1}.96404$	1.08630	0.03596
	$(NH_4)_2MoO_4$	1.25350	0.09812	0.79778	$\bar{1}.90188$
$PbMoO_4$	Mo	0.26151	$\bar{1}.41749$	3.82390	0.58251
	MoO_3	0.39226	$\bar{1}.59358$	2.54936	0.40642
	$(NH_4)_2MoO_4$	0.53414	$\bar{1}.72766$	1.87220	0.27234
Neodymium,					
Nd_2O_3 = 143.3	Nd	0.85655	$\bar{1}.93275$	1.16740	0.06725
Nickel, Ni = 58.68					
Ni	$Ni(NO_3)_2.6H_2O$	4.95560	0.69510	0.20179	$\bar{1}.30490$
	NiO	1.27260	0.10471	0.78576	$\bar{1}.89529$
	$NiSO_4.7H_2O$	4.78630	0.68000	0.20893	$\bar{1}.32000$
NiO	$Ni(NO_3)_2.6H_2O$	3.89390	0.59039	0.25681	$\bar{1}.40961$
	$NiSO_4.7H_2O$	3.76090	0.57529	0.26590	$\bar{1}.42471$
$NiSO_4$	Ni	0.37919	$\bar{1}.57886$	2.63710	0.42114
	$Ni(NO_3)_2.6H_2O$	1.87920	0.27396	0.53216	$\bar{1}.72604$
	NiO	0.48258	$\bar{1}.68357$	2.07210	0.31643
	$NiSO_4.7H_2O$	1.81500	0.25886	0.55098	$\bar{1}.74114$
Nitrogen, N = 14.01					
$AgNO_2$	HNO_2	0.30554	$\bar{1}.48507$	3.27290	0.51493
	N_2O_3	0.24699	$\bar{1}.39269$	4.04870	0.60731
KNO_3	N_2O_5	0.53417	$\bar{1}.72768$	1.87210	0.27232
N	HNO_3	4.49820	0.65304	0.22231	$\bar{1}.34696$
	NO_2	3.28410	0.51641	0.30450	$\bar{1}.48359$
	N_2O_3	2.71310	0.43346	0.36858	$\bar{1}.56654$
	NO_3	4.42610	0.64602	0.22593	$\bar{1}.35398$
	N_2O_5	3.85510	0.58603	0.25940	$\bar{1}.41397$
$NaNO_3$	N	0.16481	$\bar{1}.21697$	6.06780	0.78303

A — Weighed or Found.	Required.	A		B	
B — Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Nitrogen					
$NaNO_3$	N_2O_5	0.63533	$\bar{1}.80300$	1.57400	0.19700
NH_3	HNO_3	3.70060	0.56827	0.27023	$\bar{1}.43173$
	N	0.82268	$\bar{1}.91523$	1.21550	0.08477
	N_2O_5	3.17140	0.50126	0.31531	$\bar{1}.49874$
NH_4Cl	HNO_3	1.17800	0.07113	0.84893	$\bar{1}.92887$
	N	0.26187	$\bar{1}.41809$	3.81870	0.58191
$(NH_4)_2PtCl_6$	HNO_3	0.28385	$\bar{1}.45309$	3.52300	0.54691
	N	0.06310	$\bar{2}.80005$	15.8469	1.19995
	N_2O_5	0.24327	$\bar{1}.38608$	4.11010	0.61392
$(NH_4)_2SO_4$	N	0.21203	$\bar{1}.32641$	4.71620	0.67359
	N_2O_5	0.81741	$\bar{1}.91244$	1.22340	0.08756
Pt	HNO_3	0.64570	$\bar{1}.81003$	1.54796	0.18997
	N	0.14345	$\bar{1}.15699$	6.96649	0.84301
	N_2O_5	0.55338	$\bar{1}.74302$	1.80708	0.25698
SO_3	HNO_3	1.57410	0.19704	0.63527	$\bar{1}.80296$
	N	0.34995	$\bar{1}.54400$	2.85760	0.45600
	N_2O_5	1.34910	0.13003	0.74126	$\bar{1}.86997$
Osmium, Os = 190.9					
OsO_4	Os	0.74893	$\bar{1}.87444$	1.33530	0.12556
Palladium, Pd = 106.7					
K_2PdCl_6	Pd	0.26831	$\bar{1}.42864$	3.72700	0.57136
	$PdCl_2.2H_2O$	0.53726	$\bar{1}.73018$	1.86130	0.26982
Pd	$PdCl_2.2H_2O$	2.00240	0.30154	0.49941	$\bar{1}.69846$
	$Pd(NO_3)_2$	2.16230	0.33493	0.46245	$\bar{1}.66507$
PdI_2	Pd	0.29594	$\bar{1}.47120$	3.37910	0.52880
Phosphorus, P = 31.04					
Ag_3PO_4	P	0.07414	$\bar{2}.87004$	13.4884	1.12996
	PO_4	0.22700	$\bar{1}.35603$	4.40520	0.64397
	P_2O_5	0.16968	$\bar{1}.22962$	5.89354	0.77038
$Ag_4P_2O_7$	P	0.10251	$\bar{1}.01077$	9.75500	0.98923
	PO_4	0.31388	$\bar{1}.49676$	3.18600	0.50324
	P_2O_5	0.23461	$\bar{1}.37035$	4.26229	0.62965
Al_2O_3	P_2O_5	1.38902	0.14308	0.71933	$\bar{1}.85692$
$AlPO_4$	PO_4	0.77830	$\bar{1}.89115$	1.28453	0.10885
	P_2O_5	0.58175	$\bar{1}.76474$	1.71895	0.23526
$Ca_3(PO_4)_2$	P_2O_5	0.45787	$\bar{1}.66075$	2.18400	0.33925
$FePO_4$	PO_4	0.62991	$\bar{1}.79928$	1.58751	0.20072
	P_2O_5	0.47080	$\bar{1}.67289$	2.12380	0.32711
$Mg_2P_2O_7$	Na_2HPO_4	1.27559	0.10571	0.78395	$\bar{1}.89429$
	$Na_2HPO_4.12H_2O$	3.21638	0.50744	0.31006	$\bar{1}.49256$

A: Weighed or Found.	A: Required.	A		B	
B: Required.	**B: Weighed or Found.**	**Factor.**	**Logarithm.**	**Factor.**	**Logarithm.**
Phosphorus					
$Mg_2P_2O_7$	$NaNH_4HPO_4.4H_2O$	1.87713	0.27373	0.53244	$\bar{1}.72627$
	P	0.27861	$\bar{1}.44511$	3.58766	0.55481
	PO_4	0.85384	$\bar{1}.93138$	1.17116	0.06862
	P_2O_5	0.63852	$\bar{1}.80517$	1.56615	0.19483
$(NH_4)_3PO_4(MoO_3)_{12}$	P	0.01654	$\bar{2}.21842$	60.4755	1.78158
	PO_4	0.05063	$\bar{2}.70441$	19.7591	1.29559
	P_2O_5	0.03784	$\bar{2}.57800$	26.4243	1.42200
P_2O_5	Na_2HPO_4	1.99960	0.30094	0.50010	$\bar{1}.69906$
	$Na_2HPO_4.12H_2O$	5.04282	0.70267	0.19830	$\bar{1}.29733$
	$NaNH_4HPO_4.4H_2O$	2.94414	0.46896	0.33966	$\bar{1}.53104$
	P	0.43694	$\bar{1}.64042$	2.28863	0.35958
$U_2P_2O_1$	P	0.08682	$\bar{2}.93860$	11.5185	1.06140
	PO_4	0.26582	$\bar{1}.42459$	3.76196	0.57541
	P_2O_5	0.19869	$\bar{1}.29817$	5.03300	0.70183
Platinum, Pt = 195.0					
K_2PtCl_6	$H_2PtCl_6.6H_2O$	1.06564	0.02761	0.93844	$\bar{1}.97239$
	Pt	0.40151	$\bar{1}.60370$	2.49057	0.39630
	$PtCl_4$	0.69326	$\bar{1}.84090$	1.44243	0.15910
	$PtCl_4.5H_2O$	0.87856	$\bar{1}.94377$	1.13823	0.05623
$(NH_4)_2PtCl_6$	Pt	0.43960	$\bar{1}.64306$	2.27478	0.35694
	$PtCl_4$	0.75904	$\bar{1}.88026$	1.31745	0.11974
	$PtCl_6$	0.91876	$\bar{1}.96320$	1.08843	0.03680
Pt	$H_2PtCl_6.6H_2O$	2.65580	0.42419	0.37654	$\bar{1}.57581$
	$PtCl_4$	1.72663	0.23720	0.57917	$\bar{1}.76280$
	$PtCl_4.5H_2O$	2.18810	0.34007	0.45701	$\bar{1}.65993$
Potassium, K = 39.10					
Ag	KBr	1.10330	0.04268	0.90640	$\bar{1}.95732$
	KCl	0.69114	$\bar{1}.83957$	1.44690	0.16043
	$KClO_3$	1.13611	0.05541	0.88022	$\bar{1}.94459$
	$KClO_4$	1.28440	0.10870	0.77857	$\bar{1}.89130$
	KCN	0.60354	$\bar{1}.78071$	1.65680	0.21929
	KI	1.53900	0.18722	0.64981	$\bar{1}.81278$
AgBr	KBr	0.63375	$\bar{1}.80192$	1.57790	0.19808
	$KBrO_3$	0.88934	$\bar{1}.94907$	1.12440	0.05093
AgCl	KCl	0.52017	$\bar{1}.71614$	1.92250	0.28386
	$KClO_3$	0.85503	$\bar{1}.93198$	1.16960	0.06802
	$KClO_4$	0.96666	$\bar{1}.98527$	1.03450	0.01473
AgCN	KCN	0.48630	$\bar{1}.68690$	2.05640	0.31310

A Weighed or Found.	Required.	A		B	
B Required.	**Weighed or Found.**	**Factor.**	**Logarithm.**	**Factor.**	**Logarithm.**
Potassium					
AgI	KI	0.70707	$\bar{1}$.84946	1.41430	0.15054
	KIO_3	0.91148	$\bar{1}$.95975	1.09710	0.04025
$BaCrO_4$	K_2CrO_4	0.76650	$\bar{1}$.88451	1.30453	0.11549
	$K_2Cr_2O_7$	0.58019	$\bar{1}$.76357	1.72359	0.23643
$BaSO_4$	$KHSO_4$	0.58340	$\bar{1}$.76597	1.71410	0.23403
	K_2S	0.47249	$\bar{1}$.67439	2.11640	0.32561
	K_2SO_4	0.74659	$\bar{1}$.87308	1.33950	0.12692
Br	K	0.48924	$\bar{1}$.68952	2.04400	0.31048
	KBr	1.48920	0.17296	0.67149	$\bar{1}$.82704
CaF_2	$KF.2H_2O$	2.41080	0.38216	0.41480	$\bar{1}$.61784
$CaSO_4$	$KF.2H_2O$	1.38260	0.14071	0.72325	$\bar{1}$.85929
Cl	K	1.10270	0.04244	0.90691	$\bar{1}$.95756
	KCl	2.10260	0.32277	0.47558	$\bar{1}$.67723
	$KClO_3$	3.45630	0.53861	0.28933	$\bar{1}$.46139
	$KClO_4$	3.90750	0.59190	0.25592	$\bar{1}$.40810
	K_2O	1.32820	0.12328	0.75287	$\bar{1}$.87672
CO_2	K_2O	2.14090	0.33060	0.46709	$\bar{1}$.66940
	K_2CO_3	3.14090	0.49706	0.31838	$\bar{1}$.50294
I	KI	1.30810	0.11663	0.76448	$\bar{1}$.88337
	KIO_3	1.68630	0.22692	0.59304	$\bar{1}$.77308
K	K_2O	1.20460	0.08084	0.83015	$\bar{1}$.91916
	KNO_3	2.58590	0.41261	0.38671	$\bar{1}$.58739
KBr	K	0.32852	$\bar{1}$.51656	3.04400	0.48344
	K_2O	0.39573	$\bar{1}$.59740	2.52700	0.40260
KCl	K	0.52440	$\bar{1}$.71967	1.90690	0.28033
	K_2CO_3	0.92677	$\bar{1}$.96697	1.07900	0.03303
	$K_2Cr_2O_7$	1.97050	0.29480	0.50699	$\bar{1}$.70500
	$KHCO_3$	1.34270	0.12796	0.74480	$\bar{1}$.87204
	KNO_3	1.35600	0.13228	0.73742	$\bar{1}$.86772
	K_2O	0.63169	$\bar{1}$.80051	1.58300	0.19949
KCl	K_2SO_4	1.16860	0.06768	0.85570	$\bar{1}$.93232
KI	K	0.23551	$\bar{1}$.37202	4.24600	0.62798
	K_2O	0.28370	$\bar{1}$.45286	3.52480	0.54714
KOH	K_2CO_3	1.23150	0.09044	0.81201	$\bar{1}$.90956
	K_2O	0.83942	$\bar{1}$.92398	1.19130	0.07602
K_2O	K	0.83015	$\bar{1}$.91916	1.20460	0.08084
	K_2CO_3	1.46710	0.16646	0.68161	$\bar{1}$.83354
	$K_2Cr_2O_7$	3.12314	0.49459	0.32019	$\bar{1}$.50541
	$KHCO_3$	1.06270	0.02642	0.94098	$\bar{1}$.97358
	KNO_3	2.14660	0.33177	0.46583	$\bar{1}$.66823
	K_2SO_4	1.85000	0.26717	0.54055	$\bar{1}$.73283
K_2PtCl_6	K	0.16084	$\bar{1}$.20643	6.21686	0.79357

A Weighed or Found.	Required.	A Factor.	A Logarithm.	B Factor.	B Logarithm.
B Required.	Weighed or Found.				
Potassium					
K_2PtCl_6	K_2CO_3	0.28427	$\bar{1}.45373$	3.51781	0.54627
	KCl	0.30674	$\bar{1}.48676$	3.26015	0.51324
	$KHCO_3$	0.20591	$\bar{1}.31369$	4.85634	0.68631
	KNO_3	0.41595	$\bar{1}.61904$	2.40417	0.38096
	K_2O	0.19376	$\bar{1}.28727$	5.16100	0.71273
	K_2SO_4	0.35846	$\bar{1}.55444$	2.78971	0.44556
	$K_2SO_4.Al_2(SO_4)_3.24H_2O$	1.95218	0.29052	0.51225	$\bar{1}.70948$
	$K_2SO_4.Cr_2(SO_4)_3 24H_2O$	2.05547	0.31282	0.48661	$\bar{1}.68718$
K_2SO_4	K	0.44873	$\bar{1}.65199$	2.22850	0.34801
	K_2CO_3	0.79303	$\bar{1}.89929$	1.26100	0.10071
	KCl	0.85570	$\bar{1}.93232$	1.16860	0.06768
	$KHCO_3$	1.14890	0.06028	0.87040	$\bar{1}.93972$
	$KHSO_4$	1.56290	0.19393	0.63983	$\bar{1}.80607$
	KNO_2	0.97679	$\bar{1}.98980$	1.02380	0.01020
	KNO_3	1.16040	0.06460	0.86179	$\bar{1}.93540$
	K_2O	0.54055	$\bar{1}.73283$	1.85000	0.26717
	K_2S	0.63291	$\bar{1}.80134$	1.58000	0.19866
$Mg_2As_2O_7$	K_3AsO_4	1.65031	0.21756	0.60596	$\bar{1}.78244$
	K_2HAsO_4	1.40500	0.14768	0.71173	$\bar{1}.85232$
Mn_3O_3	K_2MnO_4	2.58480	0.41244	0.38686	$\bar{1}.58756$
	$KMnO_4$	2.07210	0.31642	0.48259	$\bar{1}.68358$
MnS	K_2MnO_4	2.26590	0.35524	0.44133	$\bar{1}.64476$
	$KMnO_4$	1.81650	0.25922	0.55053	$\bar{1}.74078$
N	KNO_3	7.21690	0.85835	0.13857	$\bar{1}.14165$
NH_3	KNO_3	5.93720	0.77358	0.16843	$\bar{1}.22642$
NO	KNO_3	3.36920	0.52752	0.29681	$\bar{1}.47248$
N_2O_3	KNO_2	2.23910	0.35008	0.44660	$\bar{1}.64992$
N_2O_5	K_2O	0.87207	$\bar{1}.94055$	1.14670	0.05945
	KNO_3	1.87210	0.27232	0.53417	$\bar{1}.72768$
Pt	K	0.40062	$\bar{1}.60273$	2.49612	0.39727
	KCl	0.76394	$\bar{1}.88306$	1.30900	0.11694
SiO_2	K_2SiO_3	2.56220	0.40861	0.39029	$\bar{1}.59139$
SO_3	K_2SO_4	2.17650	0.33775	0.45946	$\bar{1}.66225$
Praseodymium, Pr = 140.6					
Pr_2O_3	Pr	0.85420	$\bar{1}.93156$	1.17070	0.06844
Rhodium, Rh = 102.9					
Rh	Na_3RhCl_6	3.73820	0.57266	0.26751	$\bar{1}.42734$
	$RhCl_3$	2.03380	0.30831	0.49169	$\bar{1}.69169$

A: Weighed or Found.	Required.	A		B	
B: Required.	**Weighed or Found.**	**Factor.**	**Logarithm.**	**Factor.**	**Logarithm.**
Rubidium, Rb=85.45					
AgCl	Rb	0.59612	$\bar{1}.77534$	1.67750	0.22466
	RbCl	0.84353	$\bar{1}.92610$	1.18550	0.07390
Cl	Rb	2.40980	0.38197	0.41498	$\bar{1}.61803$
	RbCl	3.40980	0.53273	0.29327	$\bar{1}.46727$
Rb	RbCl	1.41500	0.15076	0.70671	$\bar{1}.84924$
	Rb_2CO_3	1.35100	0.13068	0.74015	$\bar{1}.86932$
	Rb_2O	1.09370	0.03887	0.91438	$\bar{1}.96113$
	Rb_2SO_4	1.56220	0.19372	0.64015	$\bar{1}.80628$
RbCl	Rb_2CO_3	0.95481	$\bar{1}.97992$	1.04730	0.02008
	Rb_2SO_4	1.10400	0.04296	0.90581	$\bar{1}.95704$
Rb_2CO_3	$RbHCO_3$	1.26860	0.10333	0.78826	$\bar{1}.89667$
Rb_2O	RbCl	1.2939	0.11189	0.77288	$\bar{1}.88811$
	Rb_2SO_4	1.42840	0.15484	0.70008	$\bar{1}.84515$
Rb_2PtCl_6	Rb	0.29523	$\bar{1}.47016$	3.38616	0.52984
	RbCl	0.41776	$\bar{1}.62092$	2.39376	0.37908
	Rb_2CO	0.39874	$\bar{1}.60084$	2.50706	0.39916
	$RbHCO_3$	0.50602	$\bar{1}.70417$	1.97618	0.29583
	Rb_2O	0.32287	$\bar{1}.50903$	3.09721	0.49097
Rb_2SO_4	Rb_2CO_3	0.86489	$\bar{1}.93696$	1.15620	0.06304
	$RbHCO_3$	1.09720	0.04029	0.91140	$\bar{1}.95971$
Selenium, Se=79.2					
Se	H_2SeO_3	1.63150	0.21258	0.61294	$\bar{1}.78742$
	H_2SeO_4	1.83360	0.26329	0.54539	$\bar{1}.73671$
	SeO_2	1.40400	0.14737	0.71225	$\bar{1}.85263$
	SeO_3	1.60600	0.20576	0.62265	$\bar{1}.79424$
Silicon, Si=28.3					
$BaSiF_6$	SiF_4	0.37294	$\bar{1}.57163$	2.68140	0.42837
	SiO_2	0.21561	$\bar{1}.33367$	4.63800	0.66633
K_2SiF_6	SiF_4	0.47301	$\bar{1}.67487$	2.11410	0.32513
	SiO_2	0.27347	$\bar{1}.43691$	3.65670	0.56309
SiO_2	H_2SiO_3	1.29880	0.11355	0.76993	$\bar{1}.88645$
	Si	0.46933	$\bar{1}.67147$	2.13070	0.32853
	SiF_4	1.72960	0.23796	0.57815	$\bar{1}.76204$
	SiO_3	1.26530	0.10220	0.79031	$\bar{1}.89780$
	SiO_4	1.53070	0.18488	0.65331	$\bar{1}.81512$
	Si_2O	1.39800	0.14551	0.71530	$\bar{1}.85449$
	$Si(OH)_4$	1.59750	0.20344	0.62598	$\bar{1}.79656$
Silver, Ag=107.88					
Ag	$AgNO_3$	1.57480	0.19723	0.63499	$\bar{1}.80277$
	Ag_2O	1.07420	0.03107	0.93095	$\bar{1}.96893$

A: Weighed or Found. B: Required.	A: Required. B: Weighed or Found.	A: Factor.	A: Logarithm.	B: Factor.	B: Logarithm.
Silver					
AgBr	Ag	0.57443	$\bar{1}$.75924	1.74080	0.24076
AgCl	Ag	0.75261	$\bar{1}$.87657	1.32870	0.12343
	$AgNO_3$	1.18520	0.07380	0.84372	$\bar{1}$.92620
	Ag_2O	0.80842	$\bar{1}$.90764	1.23700	0.09236
AgCN	Ag	0.80573	$\bar{1}$.90619	1.24110	0.09381
AgI	Ag	0.45945	$\bar{1}$.66224	2.17650	0.33776
Ag_3PO_4	Ag	0.77317	$\bar{1}$.88828	1.29318	0.11182
$Ag_4P_2O_7$	Ag	0.71253	$\bar{1}$.85281	1.40342	0.14719
Br	Ag	1.34980	0.13028	0.74083	$\bar{1}$.86972
	AgBr	2.34980	0.37104	0.42556	$\bar{1}$.62896
Cl	Ag	3.04230	0.48320	0.32870	$\bar{1}$.51680
	AgCl	4.04230	0.60663	0.24738	$\bar{1}$.39337
I	Ag	0.84998	$\bar{1}$.92941	1.17650	0.07059
	AgI	1.85000	0.26717	0.54055	$\bar{1}$.73283
Sodium, **Na** = 23.00					
Ag	NaBr	0.95622	$\bar{1}$.98056	1.04580	0.01944
	NaCl	0.54190	$\bar{1}$.73392	1.84530	0.26608
	NaI	1.38970	0.14292	0.71958	$\bar{1}$.85708
AgBr	NaBr	0.54802	$\bar{1}$.73880	1.82470	0.26120
AgCl	NaCl	0.40784	$\bar{1}$.61049	2.45200	0.38951
AgI	NaI	0.63850	$\bar{1}$.80516	1.56610	0.19484
$BaSO_4$	$NaHSO_4$	0.51440	$\bar{1}$.71130	1.94400	0.28870
	$NaHSO_4.H_2O$	0.59155	$\bar{1}$.77199	1.69040	0.22801
	Na_2S	0.33444	$\bar{1}$.52431	2.99010	0.47569
	Na_2SO_3	0.54010	$\bar{1}$.73247	1.85150	0.26753
	$Na_2SO_3.7H_2O$	1.08030	0.03354	0.92568	$\bar{1}$.96646
	Na_2SO_4	0.60860	$\bar{1}$.78433	1.64320	0.21567
	$Na_2SO_4.10H_2O$	1.38040	0.14000	0.72444	$\bar{1}$.86000
B_2O_3	$Na_2B_4O_7$	1.44290	0.15922	0.69308	$\bar{1}$.84078
	$Na_2B_4O_7.10H_2O$	2.72970	0.43612	0.36634	$\bar{1}$.56388
Br	Na	0.28779	$\bar{1}$.45907	3.47480	0.54093
	NaBr	1.28780	0.10984	0.77654	$\bar{1}$.89016
	Na_2O	0.38788	$\bar{1}$.58870	2.57810	0.41130
$CaCO_3$	Na_2CO_3	1.05900	0.02492	0.94423	$\bar{1}$.97508
CaF_2	NaF	1.07570	0.03168	0.92965	$\bar{1}$.96832
CaO	Na_2CO_3	1.88980	0.27642	0.52915	$\bar{1}$.72358
$CaSO_4$	Na_2CO_3	0.77850	$\bar{1}$.89126	1.28450	0.10874
Cl	Na	0.64862	$\bar{1}$.81199	1.54170	0.18801
	NaCl	1.64860	0.21712	0.60657	$\bar{1}$.78288
	Na_2O	0.87422	$\bar{1}$.94162	1.14390	0.05838
CO_2	Na_2CO_3	2.40910	0.38186	0.41509	$\bar{1}$.61814

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Sodium					
CO_2	Na_2O	1.40910	0.14894	0.70968	$\bar{1}.85106$
H_3BO_3	$Na_2B_4O_7$	0.81420	$\bar{1}.91073$	1.22820	0.08927
	$Na_2B_4O_7.10H_2O$	1.54040	0.18763	0.64918	$\bar{1}.81237$
I	Na	0.18122	$\bar{1}.25820$	5.51820	0.74180
	NaI	1.18120	0.07233	0.84659	$\bar{1}.92767$
	Na_2O	0.24425	$\bar{1}.38783$	4.09420	0.61217
KBF_4	$Na_2B_4O_7$	0.40047	$\bar{1}.60257$	2.49710	0.39743
	$Na_2B_4O_7.10H_2O$	0.75765	$\bar{1}.87947$	1.31990	0.12053
$Mg_2As_2O_7$	Na_2HAsO_3	1.09471	0.03930	0.91348	0.96070
	Na_2HAsO_4	1.19777	0.07837	0.83490	$\bar{1}.92163$
$Mg_2P_2O_7$	Na_2HPO_4	1.27559	0.10571	0.78395	$\bar{1}.89429$
	$Na_2HPO_4.12H_2O$	3.21689	0.50744	0.31086	$\bar{1}.49256$
	$Na_4P_2O_7.10H_2O$	2.00360	0.30181	0.49911	$\bar{1}.69820$
	$NH_4NaHPO_4.4H_2O$	1.87813	0.27373	0.53244	$\bar{1}.72627$
NaBr	Na	0.22348	$\bar{1}.34923$	4.47470	0.65077
	Na_2O	0.30120	$\bar{1}.47886$	3.32000	0.52114
NaCl	Na	0.39343	$\bar{1}.59487$	2.54180	0.40513
	Na_2CO_3	0.90661	$\bar{1}.95742$	1.10300	0.04258
	$NaHCO_3$	1.43700	0.15746	0.69589	$\bar{1}.84254$
	Na_2HPO_4	1.21495	0.08456	0.82308	$\bar{1}.91544$
	Na_2O	0.53028	$\bar{1}.72451$	1.88580	0.27549
	Na_2SO_4	1.21520	0.08462	0.82296	$\bar{1}.91538$
Na_2CO_3	Na	0.43396	$\bar{1}.63745$	2.30440	0.36255
	$NaHCO_3$	1.58500	0.2004	0.63090	$\bar{1}.79996$
	Na_2O	0.58490	$\bar{1}.76708$	1.70970	0.23292
	NaOH	0.75486	$\bar{1}.87787$	1.32470	0.12213
$NaHCO_3$	Na	0.27379	$\bar{1}.43741$	3.65250	0.56259
	Na_2O	0.36901	$\bar{1}.56704$	2.71000	0.43296
NaI	Na	0.15341	$\bar{1}.18587$	6.51830	0.81413
	Na_2O	0.20678	$\bar{1}.31550$	4.83500	0.68440
$NaNO_3$	Na_2O	0.36467	$\bar{1}.56189$	2.74230	0.43811
Na_2O	Na	0.74194	$\bar{1}.87037$	1.34780	0.12963
	Na_2HPO_4	2.29111	0.36005	0.43646	$\bar{1}.63995$
	NaOH	1.29060	0.11079	0.77484	$\bar{1}.88921$
$Na_4P_2O_7$	Na_2HPO_4	1.06774	0.02846	0.93656	$\bar{1}.97154$
	$Na_2HPO_4.12H_2O$	2.69269	0.43019	0.37139	$\bar{1}.56981$
Na_2SO_4	Na	0.32378	$\bar{1}.51026$	3.08850	0.48974
	Na_2CO_3	0.74613	$\bar{1}.87281$	1.34030	0.12719
	$Na_2CO_3.10H_2O$	2.01420	0.30411	0.49646	$\bar{1}.69589$
	Na_2O	0.43640	$\bar{1}.63989$	2.29150	0.36011
N	$NaNO_3$	6.06780	0.78303	0.16481	$\bar{1}.21697$
NH_3	$NaNO_3$	4.99180	0.69826	0.20033	$\bar{1}.30174$

A: Weighed or Found. B: Required.	A: Required. B: Weighed or Found.	A Factor.	A Logarithm.	B Factor.	B Logarithm.
Sodium					
NH_3	$NaNH_4HPO_4.4H_2O$	12.2790	1.08916	0.08144	$\bar{2}$.91084
NO	$NaNO_3$	2.83270	0.45220	0.35302	$\bar{1}$.54780
N_2O_5	$NaNO_3$	1.57400	0.19700	0.63533	$\bar{1}$.80300
	Na_2O	0.57397	$\bar{1}$.75889	1.74220	0.24111
P_2O_5	Na_2HPO_4	1.99960	0.30094	0.50010	$\bar{1}$.69906
	$Na_2HPO_4.12H_2O$	5.04282	0.70267	0.19830	$\bar{1}$.29733
	$NaNH_4HPO_4.4H_2O$	2.94414	0.46896	0.33966	$\bar{1}$.53104
SO_2	$NaHSO_3$	1.62440	0.21071	0.61559	$\bar{1}$.78929
	Na_2SO_3	1.96780	0.29399	0.50817	$\bar{1}$.70601
	$Na_2SO_3.7H_2O$	3.93600	0.59506	0.25406	$\bar{1}$.40494
SO_3	Na_2O	0.77432	$\bar{1}$.88892	1.29140	0.11108
	Na_2SO_4	1.77430	0.24903	0.56360	$\bar{1}$.75097
Strontium, Sr = 87.62					
CO_2	$SrCO_3$	3.35523	0.52572	0.29804	$\bar{1}$.47428
SO_3	SrO	1.29430	0.11203	0.77262	$\bar{1}$.88797
	$SrSO_4$	2.29421	0.36063	0.43588	$\bar{1}$.63937
$SrCO_3$	Sr	0.59358	$\bar{1}$.77348	1.68470	0.22652
	$SrCl_2$	1.07400	0.03100	0.93110	$\bar{1}$.96900
	$Sr(HCO_3)_2$	1.42010	0.15232	0.70417	$\bar{1}$.84768
	$Sr(NO_3)_2$	1.43370	0.15645	0.69751	$\bar{1}$.84355
	SrO	0.70198	$\bar{1}$.84633	1.42453	0.15367
SrO	Sr	0.84558	$\bar{1}$.92715	1.18266	0.07285
	$SrCl_2$	1.52993	0.18467	0.65363	$\bar{1}$.81533
	$Sr(HCO_3)_2$	2.02279	0.30599	0.49432	$\bar{1}$.69401
$SrSO_4$	Sr	0.47703	$\bar{1}$.67855	2.09629	0.32145
	$SrCl_2$	0.86312	$\bar{1}$.93607	1.15859	0.06393
	$SrCO_3$	0.80366	$\bar{1}$.90507	1.24431	0.09493
	$Sr(NO_3)_2$	1.15220	0.06152	0.86792	$\bar{1}$.93848
	SrO	0.56415	$\bar{1}$.75140	1.77257	0.24860
Sulphur, S = 32.07					
As_2S_3	H_2S	0.41539	$\bar{1}$.61845	2.40740	0.38155
	S	0.39077	$\bar{1}$.59192	2.55910	0.40808
$BaSO_4$	H_2S	0.14604	$\bar{1}$.16446	6.84760	0.83554
	H_2SO_3	0.35166	$\bar{1}$.54612	2.84370	0.45388
	H_2SO_4	0.42020	$\bar{1}$.62345	2.37990	0.37655
	S	0.13738	$\bar{1}$.13793	7.27900	0.86207
	SO_2	0.27446	$\bar{1}$.43848	3.64350	0.56152
	SO_3	0.34300	$\bar{1}$.53530	2.91540	0.46470
	SO_4	0.41155	$\bar{1}$.61442	2.42980	0.38558

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Sulphur					
CdS	H_2S	0.23597	$\bar{1}$.37285	4.23790	0.62715
	S	0.22198	$\bar{1}$.34632	4.50480	0.65368
$(NH_4)_2SO_4$	SO_3	0.60591	$\bar{1}$.78241	1.65040	0.21759
	H_2SO_4	0.74226	$\bar{1}$.87056	1.34720	0.12944
SO_3	H_2S	0.42576	$\bar{1}$.62916	2.34880	0.37084
	H_2SO_4	1.22500	0.08815	0.81630	$\bar{1}$.91185
Tantalum, Ta = 181.5					
Ta	Ta_2O_5	1.21622	0.08501	0.82072	$\bar{1}$.91419
	$TaCl_5$	1.97668	0.29594	0.50590	$\bar{1}$.70406
Ta_2O_5	$TaCl_5$	1.62241	0.21016	0.61637	$\bar{1}$.78984
	Ta_2O_4	0.96472	$\bar{1}$.98440	1.03657	0.01560
Tellurium, Te = 127.5					
Te	H_2TeO_4	1.51770	0.18121	0.65886	$\bar{1}$.81879
	$H_2TeO_4.2H_2O$	1.80030	0.25536	0.55544	$\bar{1}$.74464
	TeO_2	1.25090	0.09725	0.79935	$\bar{1}$.90274
	TeO_3	1.37650	0.13877	0.72649	$\bar{1}$.86123
$(TeO_2)_2SO_3$	Te	0.63898	$\bar{1}$.80549	1.5649	0.19451
Thallium, Tl = 204.0					
Tl	TlCl	1.17380	0.06960	0.85192	$\bar{1}$.93040
	Tl_2CO_3	1.14700	0.05959	0.87179	$\bar{1}$.94041
	TlI	1.62220	0.21010	0.61645	$\bar{1}$.78990
	$TlNO_3$	1.30400	0.11527	0.76688	$\bar{1}$.88473
	Tl_2O	1.03920	0.01671	0.96226	$\bar{1}$.98329
Tl_2CrO_4	Tl	0.77864	$\bar{1}$.89133	1.28430	0.10867
$TlHSO_4$	Tl	0.67755	$\bar{1}$.83094	1.47590	0.16906
TlI	Tl	0.61645	$\bar{1}$.78990	1.62220	0.21010
Tl_2PtCl_6	Tl	0.50002	$\bar{1}$.69899	1.99992	0.30101
	TlCl	0.58695	$\bar{1}$.76859	1.70375	0.23141
	Tl_2CO_3	0.57383	$\bar{1}$.75878	1.74348	0.24142
	TlI	0.81114	$\bar{1}$.90909	1.23285	0.09091
	$TlNO_3$	0.65202	$\bar{1}$.81426	1.53370	0.18574
	Tl_2O	0.51964	$\bar{1}$.71570	1.92444	0.28430
	Tl_2SO_4	0.61777	$\bar{1}$.79083	1.61870	0.20917
Tl_2SO_4	Tl	0.80939	$\bar{1}$.90816	1.23550	0.09184
Thorium, Th = 232.40					
ThO_2	Th	0.87898	$\bar{1}$.94398	1.13793	0.05602
	$ThCl_4$	1.41546	0.15089	0.70650	$\bar{1}$.84911
	$Th(NO_3)_4.6H_2O$	2.22260	0.34752	0.44924	$\bar{1}$.65248

A: Weighed or Found.	Required.	A		B	
B: Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Tin, Sn = 119.0					
Sn............	$SnCl_2$..........	1.59600	0.20303	0.62657	$\bar{1}$.79697
	$SnCl_2.2H_2O$......	1.89880	0.27847	0.52666	$\bar{1}$.72153
	$SnCl_4$..........	2.19200	0.34083	0.45621	$\bar{1}$.65917
	$SnCl_4.(NH_4Cl)_2$...	3.09110	0.49011	0.32351	$\bar{1}$.50989
	SnO...........	1.13440	0.05478	0.88149	$\bar{1}$.94522
	SnO_2..........	1.26891	0.10343	0.78808	$\bar{1}$.89657
SnO_2..........	Sn.............	0.78808	$\bar{1}$.89657	1.26891	0.10343
	$SnCl_2$..........	1.25780	0.09960	0.79506	$\bar{1}$.90040
	$SnCl_2.2H_2O$......	1.49630	0.17504	0.66828	$\bar{1}$.82496
	$SnCl_4$..........	1.72740	0.23740	0.57890	$\bar{1}$.76260
	$SnCl_4.(NH_4Cl)_2$...	2.43600	0.38668	0.41051	$\bar{1}$.61332
	SnO...........	0.89402	$\bar{1}$.95135	1.11854	0.04865
Titanium, Ti = 48.1					
TiO_2..........	Ti.............	0.60051	$\bar{1}$.77852	1.66520	0.22148
Tungsten, W = 184					
WO_2..........	W.............	0.85187	$\bar{1}$.93037	1.17390	0.06963
WO_3..........	W.............	0.79310	$\bar{1}$.89933	1.26090	0.10067
Uranium, U = 238.5					
UO_2..........	U.............	0.88170	$\bar{1}$.94532	1.13420	0.05468
U_3O_8..........	U.............	0.84824	$\bar{1}$.92852	1.17892	0.07148
	UO_2...........	0.96206	$\bar{1}$.98320	1.03944	0.01680
	$UO_2(NO_3)_2.6H_2O$.	1.78760	0.25227	0.55941	$\bar{1}$.74773
$U_2P_2O_{11}$.......	U.............	0.66713	$\bar{1}$.82421	1.49897	0.17579
	UO_2...........	0.75664	$\bar{1}$.87889	1.32164	0.12111
Vanadium, V = 51.0					
V_2O_5..........	V.............	0.56045	$\bar{1}$.74853	1.78428	0.25147
	VO_4...........	1.26376	0.10166	0.79130	$\bar{1}$.89834
Ytterbium, Yb = 172					
Yb_2O_3........	Yb............	0.87754	$\bar{1}$.94327	1.13960	0.05673
Yttrium, Y = 89					
Y_2O_3.........	Y.............	0.78761	$\bar{1}$.89631	1.26974	0.10369
Zinc, Zn = 65.37					
$BaSO_4$........	$ZnSO_4.7H_2O$....	1.23180	0.09055	0.81180	$\bar{1}$.90945
Zn...........	ZnO...........	1.24470	0.09508	0.80338	$\bar{1}$.90492
ZnO..........	$ZnCO_3$.........	1.54070	0.18773	0.64903	$\bar{1}$.81227
	$ZnCl_2$..........	1.67490	0.22401	0.59702	$\bar{1}$.77599
	$ZnSO_4.7H_2O$....	3.53400	0.54826	0.28297	$\bar{1}$.45174
$Zn_2P_2O_7$.......	Zn............	0.42891	$\bar{1}$.63237	2.33148	0.36763
	ZnO...........	0.53390	$\bar{1}$.72746	1.87730	0.27254

A	Weighed or Found.	Required.	A		B	
B	Required.	Weighed or Found.	Factor.	Logarithm.	Factor.	Logarithm.
Zinc,						
	ZnS	$BaSO_4$	2.39570	0.37943	0.41742	$\bar{1}.62057$
		Zn..............	0.67087	$\bar{1}.82664$	1.49060	0.17336
		ZnO.............	0.83507	$\bar{1}.92172$	1.19750	0.07828
		$ZnSO_4.7H_2O$......	2.95100	0.46998	0.33886	$\bar{1}.53002$
Zirconium,						
	Zr = 90.6					
	ZrO_2	Zr	0.73899	$\bar{1}.86864$	1.35320	0.13136

* The factors and logarithms in this column are used when the substances given in the first column are weighed or found, while those in the second column are required.

† The factors and logarithms in this column are used when the substances given in the second column are weighed or found, and those in the first column are required.

VI.—FACTORS FOR THE CALCULATION OF INDIRECT GRAVIMETRIC ANALYSES

Found. a.	Found. b.	Sought.	Factors and Their Logarithms.
$AgBr + AgCl$	Ag	Br	1.7993 (log .25511) $a-2.3884$ (log .37811) b
		Cl	1.3884 (log .14252) $b-.79930$ (log $\bar{1}.90142$) a
	$AgCl$	Br	1.7993 (log .25511) $(a-b)$
		Cl	1.0552 (log .02334) $b-0.7995$ (log $\bar{1}.90282$) a
$AgBr + AgI$	Ag	Br	3.7005 (log .56826) $b-1.7022$ (log .23101) a
		I	2.7022 (log .43172) $a-4.7025$ (log .67233) b
	$AgCl$	Br	2.78711 (log .44515) $b-1.7023$ (log .23104) a
		I	2.7023 (log .43173) $a-3.6398$ (log .56108) b
$AgCl + AgI$	Ag	Cl	.84380 (log $\bar{1}.92624$) $b-.38739$ (log $\bar{1}.58815$) a
		I	1.38777 (log .14230) $a-1.84380$ (log .26571) b
	$AgCl$	Cl	.63507 (log $\bar{1}.80281$) $b-.38739$ (log $\bar{1}.58815$) a
		I	1.38777 (log .14230) $(a-b)$
$KCl + NaCl$	$AgCl$	K	2.43195 (log .38595) $a-.99225$ (log $\bar{1}.99662$) b
		Na	.74490 (log $\bar{1}.87210$) $b-1.4318$ (log .15589) a
	Cl	K	2.43195 (log .38595) $a-4.0127$ (log .60344) b
		Na	3.0126 (log .47894) $b-1.4318$ (log .15589) a
	$K_2SO_4 + Na_2SO_4$	K	13.752 (log 1.13837) $a-11.3201$ (log 1.05386) b
		Na	8.4900 (log .92891) $b-9.9260$ (log .99677) a
$KCl + KBr$	$AgCl + AgBr$	Cl	1.3803 (log .13991) $b-2.1811$ (log .33867) a
		Br	3.7461 (log .57358) $a-1.9486$ (log .28972) b
	$AgCl$	Cl	.66173 (log $\bar{1}.82067$) $b-.7993$ (log $\bar{1}.90271$) a
		Br	1.7993 (log .25511) $a-.93476$ (log $\bar{1}.97070$) b
	KCl	Cl	1.27213 (log .10506) $b-.7992$ (log $\bar{1}.90270$) a
		Br	1.7995 (log .25510) $a-1.79930$ (log .25510) b
	K_2SO_4	Cl	1.08792 (log .03659) $b-.79928$ (log $\bar{1}.90270$) a
		Br	1.7993 (log .25511) $a-1.5923$ (log .18725) b
$KCl + KI$	$AgCl + AgI$	Cl	.93678 (log $\bar{1}.97164$) $b-1.3178$ (log .11985) a
		I	2.8921 (log .46122) $a-1.5055$ (log .17769) b
	$AgCl$	Cl	.44902 (log $\bar{1}.65227$) $b-.38777$ (log $\bar{1}.58858$) a
		I	1.38777 (log .14230) $a-.72170$ (log $\bar{1}.85836$) b
	KCl	Cl	.86230 (log $\bar{1}.93566$) $b-.38777$ (log $\bar{1}.58858$) a
		I	1.3878 (log .14231) $a-1.38777$ (log .14230) b

Found. a.	Found. b.	Sought.	Factors and Their Logarithms.
KCl + KI	K_2SO_4	Cl	7.3810(log $\bar{1}$.86812) b − .38746 (log $\bar{1}$.58825) a
		I	1.3875(log .14222) a − 1.18723(log .07455) b
KBr + KI	AgBr + AgI	Br	4.1052(log .61333) b − 5.8071 (log .76396) a
		I	7.3764(log .86784) a − 4.6757 (log .66984) b
	AgCl	Br	1.9710(log .29469) b − 1.7011 (log .23073) a
		I	2.7020(log .43169) a − 2.2441 (log .35111) b
	KCl	Br	3.7881(log .57842) b − 1.7011 (log .23073) a
		I	2.7020(log .43169) a − 4.3127 (log .63475) b
	K_2SO_4	Br	3.2415(log .51075) b − 1.7011 (log .23073) a
		I	2.7020(log .43169) a − 3.6901 (log .56704) b
$K_2SO_4 + Na_2SO_4$	$BaSO_4$	K	2.4368(log .38681) a − 1.4766 (log .16926) b
		Na	1.0682(log .0265) b − 1.4267 (log .15433) a
$Na_2SO_4 + Li_2SO_4$	$BaSO_4$	Na	1.39603(log .14488) a − .65754 (log $\bar{1}$.81793) b
		Li	.256355(log $\bar{1}$.40885) b − .42112 (log $\bar{1}$.62441) a
LiCl + NaCl	AgCl	Li	.17616(log $\bar{1}$.24591) b − .43195 (log $\bar{1}$.63543) a
		Na	1.4322(log .15600) a − .42363 (log $\bar{1}$.62699) b
K_2PtCl_6 + Rb_2PtCl_6	Pt	K	2.5106(log .39978) b − .84720 (log $\bar{1}$.92798) a
		Rb	1.8502(log .26721) a − 4.6080 (log .66351) b
	K_2SO_4 + Rb_2SO_4	K	.72295(log $\bar{1}$.85911) a − 1.5680 (log .19537) b
		Rb	2.8780(log .45910) b − 1.0315 (log .01354) a
Rb_2PtCl_6 + Cs_2PtCl_6	Pt	Rb	6.2232(log .79402) b − 1.8047 (log .25642) a
		Cs	2.8050(log .44793) a − 8.3123 (log .91973) b
	Rb_2SO_4 + Cs_2SO_4	Rb	2.0915(log .32048) a − 3.8964 (log .59066) b
		Cs	5.2044(log .71637) b − 2.3994 (log .38011) a
$CaCO_3 + SrCO_3$	CO_2	Ca	2.8230(log .45071) b − .84252 (log $\bar{1}$.92558) a
		Sr	1.8469(log .26643) a − 4.1905 (log .62226) b
	$CaSO_4$ + $SrSO_4$	Ca	3.4548(log .53844) b − 4.2995 (log .63341) a
		Sr	6.9660(log .84304) a − 5.1220 (log .70944) b
$CaCO_3 + BaCO_3$	CO_2	Ca	1.8395(log .26470) b − .41010 (log $\bar{1}$.61287) a
		Ba	1.4065(log .14804) a − 3.1980 (log .50489) b
	$CaSO_4$ + $BaSO_4$	Ca	2.2447(log .35116) b − 2.6684 (log .42625) a
		Ba	5.3247(log .72630) a − 3.9329 (log .59471) b
$BaCO_3 + SrCO_3$	CO_2	Ba	2.7485(log .43909) a − 9.2694 (log .96705) b
		Sr	7.8961(log .89736) b − 1.7603 (log .24559) a
	$BaSO_4$ + $SrSO_4$	Ba	14.085 (log 1.14895) a − 11.341 (log 1.05465) b
		Sr	9.6371(log .98395) b − 11.435 (log 1.05824) a

VII.—MOLECULAR AND ATOMIC WEIGHTS AND THEIR LOGARITHMS

Formula.	Formula Weight.		Formula.	Formula Weight.	
	Number.	Logarithm.		Number.	Logarithm.
Ag	107.88	2.03294	$AsCl_3$	181.34	2.25849
Ag_2	215.76	2.33397	$\frac{1}{2}As_2O_3$	98.96	1.99546
Ag_3AsO_4	462.60	2.66521	As_2O_3	197.92	2.29649
$AgBr$	187.80	2.27370	AsO_3	122.96	2.08976
$AgCN$	133.89	2.12675	$(AsO_3)_2$	245.92	2.39079
$AgCl$	143.34	2.15637	As_2O_5	229.92	2.36157
AgI	234.80	2.37070	AsO_4	138.96	2.14289
$AgIO_3$	282.80	2.45148	$(AsO_4)_2$	277.92	2.44392
$AgNO_2$	153.89	2.18721	As_2S_3	246.13	2.39116
$AgNO_3$	169.89	2.23017	As_2S_5	310.27	2.49174
$\frac{1}{2}Ag_2O$	115.88	2.06401			
Ag_2O	231.76	2.36504	Au	197.2	2.29491
Ag_3PO_4	418.68	2.62188	$AuCl_3$	303.58	2.48227
$\frac{1}{2}Ag_4P_2O_7$	302.80	2.48115	$AuCl_3.2H_2O$	339.61	2.53098
$Ag_4P_2O_7$	605.60	2.78219			
Ag_2S	247.83	2.39415	B	11.0	1.04139
			B_2	22.0	1.34242
Al	27.1	1.43297	B_2O_3	70.0	1.84510
Al_2	54.2	1.73400	$(B_2O_3)_2$	140.0	2.14613
Al_4C_3	144.4	2.15957			
$AlCl_3$	133.48	2.12542	$\frac{1}{2}Ba$	68.68	1.83683
$(AlCl_3)_2$	266.96	2.42645	Ba	137.37	2.13789
$AlCl_3.6H_2O$	241.58	2.38306	$BaCl_2$	208.29	2.31867
AlF_3	84.1	1.92480	$BaCl_2.2H_2O$	244.32	2.38796
$(AlF_3)_2$	168.2	2.22583	$BaCO_3$	197.37	2.29528
$AlK(SO_4)_2.12H_2O$	474.53	2.67627	$BaCrO_4$	253.37	2.40374
			BaF_2	175.37	2.24395
$AlNH_4(SO_4)_2.12H_2O$	453.47	2.65655	$Ba(HCO_3)_2$	259.39	2.41395
$AlNa_3F_6$	210.10	2.32243	$Ba(NO_3)_2$	261.39	2.41729
$\frac{1}{2}Al_2O_3$	51.1	1.70842	BaO	153.37	2.18574
Al_2O_3	102.2	2.00945	BaO_2	169.37	2.22884
$AlPO_4$	122.14	2.08676	$BaO_2.8H_2O$	313.50	2.49624
$(AlPO_4)_2$	244.28	2.38789	$Ba(OH)_2$	171.386	2.23398
$Al_2(SO_4)_3$	342.41	2.53454	$Ba(OH)_2.8H_2O$	315.52	2.49903
$Al_2(SO_4)_3.18H_2O$	666.70	2.82393	BaS	169.44	2.22901
			$BaSiF_6$	279.67	2.44665
As	74.96	1.87483	$BaSO_4$	233.44	2.36814
As_2	149.92	2.17586	$(BaSO_4)_2$	466.88	2.66920

Formula.	Formula Weight.		Formula.	Formula Weight.	
	Number.	Logarithm.		Number.	Logarithm.
$(BaSO_4)_3$......	700.32	2.84529	Ca..........	40.07	1.60282
$BaS_2O_3.H_2O$...	267.53	2.42737	$Ca_3(AsO_4)_2$....	398.17	2.60007
			CaC_2.........	64.07	1.80665
Be...........	9.1	0.95904	$CaCl_2$........	110.99	2.04528
$BeCl_2$.........	80.02	1.90320	$CaCl_2.6H_2O$...	219.09	2.34062
BeO..........	25.1	1.39967	$CaCO_3$.......	100.07	2.00030
$BeSO_4.4H_2O$...	177.234	2.24852	CaF_2.........	78.07	1.89248
			$(CaF_2)_2$.......	156.14	2.19351
Bi...........	208.0	2.31806	$(CaF_2)_3$......	234.21	2.36960
Bi_2...........	416.0	2.61909	$Ca(HCO_3)_2$....	162.09	2.20975
$BiAsO_4$.......	346.96	2.54028	$Ca(NO_3)_2$.....	164.09	2.21508
$Bi(NO_3)_3.5H_2O$.	484.11	2.68495	CaO.........	56.07	1.74873
$\frac{1}{2}Bi_2O_3$........	232.0	2.36549	$(CaO)_2$.......	112.14	2.04976
Bi_2O_3.........	464.0	2.66652	$(CaO)_3$.......	168.21	2.22585
BiOCl........	259.46	2.41407	$CaOCl_2$.......	126.98	2.10374
$BiONO_3$.......	286.01	2.45639	$Ca(OH)_2$.....	74.096	1.86979
Bi_2S_3.........	512.21	2.70945	$Ca_3(PO_4)_2$....	310.29	2.49178
			CaS.........	72.14	1.85818
Br...........	79.92	1.90266	$CaSO_4$.......	136.14	2.13398
Br_2...........	159.84	2.20369	$(CaSO_4)_2$.....	272.28	2.43501
Br_3...........	239.76	2.37978	$(CaSO_4)_3$.....	408.42	2.61107
Br_4...........	319.68	2.50472	$CaSO_4.2H_2O$..	172.17	2.23595
BrO_3.........	127.92	2.10694	$CaSiO_3$.......	116.37	2.06584
			$CaWO_4$.......	288.07	2.45950
C............	12.00	1.07918			
C_2...........	24.00	1.38021	Cd..........	112.4	2.05077
CH_3..........	15.024	1.17689	$CdCl_2$........	183.32	2.26316
CH_4..........	16.032	1.20498	$CdCl_2.2H_2O$...	219.33	2.34110
C_2H_2.........	26.016	1.41524	$CdCO_3$.......	172.4	2.23654
C_2H_4.........	28.032	1.44765	$Cd(NO_3)_2$.....	236.42	2.37369
C_2H_5.........	29.04	1.46300	$Cd(NO_3)_2.4H_2O$	308.48	2.48922
C_2H_6.........	30.048	1.47781	CdO.........	128.4	2.10857
C_6H_6.........	78.05	1.89237	CdS.........	144.46	2.15978
CN...........	26.01	1.41514	$CdSO_4$.......	208.47	2.31905
CNS..........	58.08	1.76403	$CdSO_4.2\frac{2}{3}H_2O$.	256.51	2.40911
CO...........	28.00	1.44716	Ce...........	140.25	2.14691
CO_2..........	44.00	1.64345	Ce_2..........	280.5	2.44793
$(CO_2)_2$........	88.00	1.94448	$Ce(NO_3)_4$.....	388.29	2.58916
CO_3..........	60.00	1.77815	$Ce(NO_3)_4.(NH_4NO_3)_2.H_2O$..	566.41	2.75313
CS_2...........	76.14	1.88161	CeO_2........	172.25	2.23616
$\frac{1}{2}Ca$.........	20.04	1.30190	$(CeO_2)_2$.......	344.5	2.53719

Formula.	Formula Weight.	
	Number.	Logarithm.
Ce_2O_3	328.5	2.51654
$Ce_2(SO_4)_3$	568.71	2.75489
Cl	35.46	1.54974
Cl_2	70.92	1.85077
Cl_3	106.38	2.02686
Cl_4	141.84	2.15180
Cl_5	177.30	2.24871
Cl_2O_5	150.92	2.17875
ClO_3	83.46	1.92148
Cl_2O_7	182.92	2.26226
ClO_4	99.46	1.99765
Co	58.97	1.77063
Co_2	117.94	2.07166
Co_3	176.91	2.24775
$CoCl_2.6H_2O$	238.00	2.37658
$Co(NO_3)_2.6H_2O$	291.09	2.46402
$Co(NO_2)_3.(KNO_2)_3$	452.33	2.65546
CoO	74.97	1.87489
$(CoO)_2$	149.94	2.17592
Co_3O_4	240.91	2.38186
$CoSO_4$	155.04	2.19044
$CoSO_4.7H_2O$	281.15	2.44894
$(CoSO_4)_2.(K_2SO_4)_3$	832.89	2.92059
Cr	52.0	1.71600
Cr_2	104.0	2.01703
$\frac{1}{2}Cr_2O_3$	76.0	1.88081
Cr_2O_3	152.0	2.18184
CrO_3	100.0	2.00000
$(CrO)_2$	200.0	2.30103
CrO_4	116.0	2.06446
Cr_2O_7	216.0	2.33445
$\frac{1}{2}Cr_2(SO_4)_3.18H_2O$	358.25	2.55419
Cs	132.81	2.12323
Cs_2	265.62	2.42426
$CsAl(SO_4)_2.12H_2O$	568.24	2.75453
$CsCl$	168.27	2.22601
$(CsCl)_2$	336.54	2.52704
Cs_2CO_3	325.62	2.51271
$CsHCO_3$	193.82	2.28739
Cs_2O	281.62	2.44966
Cs_2PtCl_6	673.58	2.82839
Cs_2SO_4	361.69	2.55834
Cu	63.57	1.80325
Cu_2	127.14	2.10429
$\frac{1}{2}Cu_2\begin{Bmatrix}C_2H_3O_2\\As_3O_6\end{Bmatrix}$	253.52	2.40401
$CuCl$	99.03	1.99577
$CuCl_2$	134.49	2.12869
$CuCl_2.2H_2O$	170.52	2.23177
$CuCNS$	121.65	2.08511
CuI	190.49	2.27988
$CuFeS_2$	183.56	2.26378
$Cu(NO_3)_2.6H_2O$	295.69	2.47083
Cu_2O	143.14	2.15576
CuO	79.57	1.90075
Cu_2S	159.21	2.20197
$CuSO_4$	159.64	2.20314
$CuSO_4.5H_2O$	249.72	2.39745
F	19	1.27875
Fe	55.84	1.74695
Fe_2	111.68	2.04798
$FeAsO_4$	194.81	2.28960
$FeCl_3$	162.22	2.21010
$FeCl_3.6H_2O$	270.32	2.43189
$Fe_7(CN)_{18}$	859.06	2.93403
$FeCO_3$	115.84	2.06386
$\frac{1}{2}Fe(HCO_3)_2$	88.93	1.94905
$Fe(HCO_3)_2$	177.86	2.25008
FeO	71.84	1.85637
$\frac{1}{2}Fe_2O_3$	79.84	1.90222
Fe_2O_3	159.68	2.20325
$\frac{1}{3}Fe_3O_4$	77.17	1.88745
Fe_3O_4	231.52	2.36459
$FePO_4$	150.88	2.17863
FeS	87.91	1.94403
FeS_2	119.99	2.07914
$FeSO_4$	151.91	2.18159

Formula.	Formula Weight.		Formula.	Formula Weight.	
	Number.	Logarithm.		Number.	Logarithm.
$FeSO_4.7H_2O$...	278.02	2.44408	HNO_2.........	47.02	1.67228
$FeSO_4.(NH_4)_2$			HNO_3.........	63.02	1.79948
$SO_4.6H_2O$ ...	392.16	2.59346	$(HNO_3)_2$......	126.04	2.10051
$\frac{1}{2}Fe_2(SO_4)_3$.....	199.95	2.30092	$HNaCO_3$......	84.08	1.92432
$Fe_2(SO_4)_3$......	399.89	2.60194	$HNa_2PO_4.$		
			$12H_2O$	358.24	2.55417
Ga...........	69.9	1.84448	HO...........	17.008	1.23065
Ga_2O_3.........	187.8	2.27370	H_2O..........	18.016	1.25565
Ga_2S_3.........	236.01	2.37293	H_2O_2.........	34.016	1.53168
			H_3PO_4........	98.06	1.99149
Ge...........	72.5	1.86034	$H_2PtCl_6.6H_2O$..	518.072	2.71439
GeO_2.........	104.5	2.01912	H_2S...........	34.09	1.53263
			H_2SO_3........	82.09	1.91429
H............	1.008	0.00346	H_2SO_4........	98.09	1.99162
H_2............	2.016	0.30449	$\frac{1}{2}H_2SO_4$........	49.04	1.69055
H_3...........	3.024	0.48058	H_2SeO_3........	129.22	2.11131
H_4...........	4.032	0.60552	H_2SeO_4.......	145.22	2.16202
H_5...........	5.040	0.70243	H_2SiF_6........	144.32	2.15932
H_6...........	6.048	0.78161	H_2SiO_3........	78.32	1.89387
H_3AsO_3.......	125.984	2.10032	H_2TeO_4.......	193.52	2.28672
H_3AsO_4.......	141.98	2.15235	$H_2TeO_4.2H_2O$..	299.55	2.36087
$HAuCl_4.4H_2O$..	412.11	2.61501			
H_3BO_3........	62.024	1.79256	Hg...........	200.6	2.30233
$(H_3BO_3)_2$......	124.05	2.09359	HgCl.........	236.06	2.37302
$(H_3BO_3)_3$......	186.07	2.26968	$HgCl_2$.........	271.52	2.43380
$(H_3BO_3)_4$......	248.10	2.39462	$Hg(CN)_2$......	252.62	2.40247
HBr..........	80.93	1.90811	HgI_2..........	454.44	2.65748
$\frac{1}{2}H_2C_2O_4$.......	45.008	1.65329	$HgNO_3$........	262.61	2.41840
$H_2C_2O_4$.......	90.016	1.95432	$Hg(NO_3)_2$.....	324.62	2.51062
$\frac{1}{2}H_2C_2O_4.2H_2O$.	63.025	1.79952	$Hg(NO_3)_2.H_2O$.	342.64	2.53410
$H_2C_2O_4.2H_2O$...	126.05	2.10054	$\frac{1}{2}Hg_2O$........	208.6	2.31931
$H.C_2H_3O_2$......	60.032	1.77838	Hg_2O.........	417.2	2.62034
$H.C_3H_5O_3$.....	90.05	1.95447	HgO..........	216.6	2.33566
$H_2.C_4H_4O_6$.....	150.05	2.17623	HgS..........	232.67	2.36560
$H_3.C_6H_5O_7$.....	192.06	2.28345	$HgSO_4$........	296.67	2.47138
HCl..........	36.47	1.56194			
$HClO_3$........	84.47	1.92670	I.............	126.92	2.10353
HCN.........	27.02	1.43169	I_2............	253.84	2.40456
HCO_2.........	45.008	1.65329	I_3............	380.76	2.58065
HF...........	20.008	1.30121	I_4............	507.68	2.70559
HI...........	127.93	2.10697	IO_3...........	174.92	2.24284
$(HI)_2$.........	255.86	2.40800	$(IO_3)_2$.........	349.84	2.54387
$HKCO_3$.......	100.11	2.00047	$\frac{1}{2}I_2O_5$.........	166.92	2.22251

Formula.	Formula Weight.	
	Number.	Logarithm.
I_2O_5	333.84	2.52354
IO_4	190.92	2.28086
$(IO_4)_2$	381.84	2.58189
$\frac{1}{2}I_2O_7$	182.92	2.26226
I_2O_7	365.84	2.56329
In	114.8	2.05994
In_2	229.6	2.36097
In_2O_3	277.6	2.44342
In_2S_3	325.81	2.51296
K	39.10	1.59218
K_2	78.20	1.89321
$KAl(SO_4)_2.12H_2O$	474.53	2.67627
K_3AsO_4	256.26	2.40868
$KAu(CN)_4.H_2O$	358.36	2.55432
KBF_4	126.10	2.10072
$(KBF_4)_4$	504.40	2.70278
KBr	119.02	2.07562
$KBrO_3$	167.02	2.22277
$K_2C_4H_4O_6$	226.23	2.35455
KCl	74.56	1.87251
$(KCl)_2$	149.12	2.17354
$KClO_3$	122.56	2.08835
$KClO_4$	138.56	2.14164
KCN	65.11	1.81365
KCNS	97.18	1.98758
K_2CO_3	138.20	2.14051
K_2CrO_4	194.2	2.28825
$\frac{1}{6}K_2Cr_2O_7$	49.04	1.69055
$\frac{1}{2}K_2Cr_2O_7$	147.10	2.16731
$K_2Cr_2O_7$	294.2	2.46864
$KCr(SO_4)_2.12H_2O$	499.43	2.69847
$KF.2H_2O$	94.13	1.97373
$K_3Fe(CN)_6$	329.20	2.51746
$K_4Fe(CN)_6$	368.33	2.56624
$K_4Fe(CN)_6.3H_2O$	422.35	2.62567
K_2GeF_6	264.7	2.42275
K_2HAsO_4	218.17	2.33880
$KHC_4H_4O_6$	188.14	2.27448
$KHCO_3$	100.11	2.00047
$(KHCO_3)_2$	200.22	2.30150
$KH_3(C_2O_4)_2.2H_2O$	254.16	2.40510
$KH(IO_3)_2$	389.95	2.59101
$KHSO_4$	136.18	2.13411
$(KHSO_4)_2$	272.36	2.43515
KI	166.02	2.22016
$\frac{1}{6}KIO_3$	35.67	1.55230
KIO_3	214.02	2.33045
$\frac{1}{5}KMnO_4$	31.61	1.49982
$KMnO_4$	158.03	2.19874
K_2MnO_4	197.13	2.29476
KNO_2	85.13	1.93008
$(KNO_2)_2$	170.22	2.23101
KNO_3	101.11	2.00479
$KNaC_4H_4O_6$	210.15	2.32253
$\frac{1}{2}K_2O$	47.10	1.67302
K_2O	94.20	1.97405
KOH	56.11	1.74904
K_2PdCl_6	397.66	2.59952
K_2PtCl_6	486.16	2.68678
K_2S	110.27	2.04256
K_2SO_4	174.27	2.24122
$KSbOC_4H_4O_6.\frac{1}{2}H_2O$	332.34	2.52158
K_2SiF_6	220.50	2.34341
K_2SiO_3	154.50	2.18893
La	139.0	2.14301
La_2O_3	326.0	2.51322
Li	6.94	0.84136
Li_2	13.88	1.14239
LiCl	42.40	1.62737
Li_2CO_3	73.88	1.86853
$LiHCO_3$	67.95	1.83219
$\frac{1}{2}Li_2O$	14.94	1.17435
Li_2O	29.88	1.47538
Li_3PO_4	115.82	2.06378
Li_2SO_4	109.95	2.04120
$Li_2SO_4.H_2O$	127.97	2.10711
$\frac{1}{2}Li_2SO_4.H_2O$	63.98	1.80608

Formula.	Formula Weight.	
	Number.	Logarithm.
Mg	24.36	1.38596
Mg_2	48.64	1.68699
$\frac{1}{2}Mg_2As_2O_7$	155.28	2.19112
$Mg_2As_2O_7$	310.56	2.49214
$MgBr_2$	184.16	2.26519
$MgBr_2.6H_2O$	292.26	2.46577
$MgCl_2$	95.24	1.97882
$MgCl_2.6H_2O$	203.34	2.30823
$MgCl_2.KCl.6H_2O$	277.90	2.44389
$MgCO_3$	84.32	1.92593
$Mg(HCO_3)_2$	146.34	2.16536
MgI_2	278.16	2.44429
$MgNH_4AsO_4.\frac{1}{2}H_2O$	190.33	2.27951
$[MgNH_4AsO_4.\frac{1}{2}H_2O]_2$	380.66	2.58054
$MgNH_4PO_4.6H_2O$	245.50	2.39005
MgO	40.32	1.60552
$\frac{1}{2}Mg_2P_2O_7$	111.36	2.04673
$Mg_2P_2O_7$	222.72	2.34776
$MgSO_4$	120.39	2.08059
$MgSO_4.7H_2O$	246.50	2.39182
$MgSiO_3$	100.62	2.00269
Mn	54.93	1.73981
Mn_2	109.86	2.04084
$MnCO_3$	114.93	2.06043
$MnCl_2.4H_2O$	197.91	2.29647
$Mn(HCO_3)_2$	176.95	2.24785
MnO	70.93	1.85083
MnO_2	86.93	1.93917
Mn_2O_3	157.86	2.19828
Mn_3O_4	228.79	2.35944
$\frac{1}{2}Mn_2P_2O_7$	141.97	2.15220
$Mn_2P_2O_7$	283.94	2.45323
MnS	87.00	1.93952
$MnSO_4$	151.00	2.17898
$MnSO_4.4H_2O$	223.06	2.34842
$MnSO_4.7H_2O$	277.11	2.44266
Mo	96	1.98227
MoO_3	144	2.15836
MoS_3	192.21	2.28377
N	14.01	1.14644
N_2	28.02	1.44747
NH_2	16.03	1.20493
NH_3	17.03	1.23121
$(NH_3)_2$	34.07	1.53237
NH_4	18.04	1.25624
$(NH_4)_2$	36.08	1.55727
$NH_4Al(SO_4)_2.12H_2O$	453.47	2.65655
NH_4Br	97.96	1.99109
NH_4Cl	53.50	1.72835
$(NH_4Cl)_2$	107.00	2.02938
$(NH_4)_2CO_3$	96.08	1.98263
$(NH_4)_2C_2O_4.2H_2O$	160.11	2.20442
NH_4HCO_3	79.05	1.89790
$NH_4Fe(SO_4)_2.12H_2O$	482.21	2.68324
$(NH_4)_2Fe(SO_4)_2.6H_2O$	392.16	2.59346
NH_4I	144.96	2.16135
$(NH_4)_2MoO_4$	196.08	2.29244
NH_4NO_3	80.05	1.90336
$(NH_4NO_3)_2$	160.10	2.20439
$NH_4NaHPO_4.4H_2O$	209.15	2.32046
$(NH_4)_2O$	52.08	1.71667
NH_4OH	35.05	1.54469
$\frac{1}{12}(NH_4)_3PO_4.12MoO_3$	156.43	2.19432
$(NH_4)_3PO_4.12MoO_3$	1877.17	3.27350
$\frac{1}{2}(NH_4)_2PtCl_6$	222.02	2.34639
$(NH_4)_2PtCl_6$	444.04	2.64742
NH_4CNS	76.12	1.88150
$(NH_4)_2SO_4$	132.15	2.12106
N_2O	44.02	1.64365
NO	30.01	1.47727
NO_2	46.01	1.66285
$\frac{1}{2}N_2O_3$	38.01	1.57990

Formula.	Formula Weight.		Formula.	Formula Weight.	
	Number.	Logarithm.		Number.	Logarithm.
N_2O_3	76.02	1.88093	$Na_4P_2O_7$	266.08	2.42501
NO_3	62.01	1.79246	$\frac{1}{2}Na_4P_2O_7.10H_2O$	223.12	2.34854
$\frac{1}{2}N_2O_5$	54.01	1.73247	Na_3RhCl_6	384.66	2.58508
N_2O_5	108.02	2.03350	Na_2S	78.07	1.89248
			Na_2SO_3	126.07	2.10064
Na	23.00	1.36173	$Na_2SO_3.7H_2O$	252.18	2.40171
Na_2	46.00	1.66276	$Na_2S_2O_3.5H_2O$	248.22	2.39483
Na_3AlF_6	210.10	2.32243	Na_2SO_4	142.07	2.15250
$Na_2B_4O_7$	202.00	2.30535	$Na_2SO_4.10H_2O$	322.23	2.50817
$Na_2B_4O_7.10H_2O$	382.16	2.58225			
$NaBr$	102.92	2.01250	Ni	58.68	1.76849
$NaC_2H_3O_2$	82.02	1.91392	$NiCl_2.6H_2O$	237.68	2.37603
$NaC_2H_3O_2.3H_2O$	136.07	2.13376	$Ni(NO_3)_2.6H_2O$	290.80	2.46359
$NaCl$	58.46	1.76686	NiO	74.68	1.87320
$(NaCl)_2$	116.92	2.06788	$NiSO_4$	154.75	2.18963
$NaClO_4$	122.46	2.08799	$NiSO_4.6H_2O$	262.85	2.41971
$NaCN$	49.01	1.69028	$NiSO_4.7H_2O$	280.86	2.44849
$\frac{1}{2}Na_2CO_3$	53.00	1.72428			
Na_2CO_3	106.00	2.02531	O	16.00	1.20412
$Na_2CO_3.10H_2O$	286.16	2.45661	O_2	32.00	1.50515
NaF	42.00	1.62325	O_3	48.00	1.68124
$(NaF)_2$	84.00	1.92428	O_4	64.00	1.80618
$Na_4Fe(CN)_6$	303.90	2.48273	O_5	80.00	1.90309
Na_2HAsO_3	169.99	2.23042	O_6	96.00	1.98227
Na_2HAsO_4	185.99	2.26949	OH	17.008	1.23065
$NaHCO_3$	84.01	1.92432			
Na_2HPO_4	142.05	2.15244	Os	190.9	2.28081
$Na_2HPO_4.$			OsO_4	254.9	2.40637
$12H_2O$	358.24	2.55417			
$NaHSO_3$	104.08	2.01736	P	31.04	1.49192
$NaHSO_4$	120.08	2.07947	P_2	62.08	1.79295
$NaHSO_4.H_2O$	138.09	2.14016	PCl_3	137.42	2.13806
NaI	149.92	2.17586	PCl_5	208.34	2.31867
$NaNH_4HPO_4.$			$\frac{1}{2}P_2O_5$	71.04	1.85150
$4H_2O$	209.15	2.32046	P_2O_5	142.08	2.15253
$NaNO_2$	69.01	1.83891	PO_4	95.04	1.97791
$NaNO_3$	85.01	1.92947	$2PO_4$	190.08	2.27894
$\frac{1}{2}Na_2O$	31.00	1.49136	P_2O_3	110.08	2.04171
Na_2O	62.00	1.79239			
Na_2O_2	78.00	1.89209	Pb	207.1	2.31618
$NaOH$	40.01	1.60215	$Pb(C_2H_3O_2)_2.$		
$NaPO_3$	102.04	2.00877	$3H_2O$	379.20	2.57887
Na_3PO_4	164.04	2.21495	$PbCl_2$	277.02	2.44407

Formula.	Formula Weight.		Formula.	Formula Weight.	
	Number.	Logarithm.		Number.	Logarithm.
$PbCO_3$	267.1	2.42667	SCN	58.08	1.76403
$\frac{1}{3}(PbCO_3)_2.$			SO_2	64.07	1.80665
$Pb(OH)_2$	258.44	2.41236	SO_3	80.07	1.90347
$(PbCO_3)_2.$			SO_4	96.07	1.98259
$Pb(OH)_2$	775.31	2.88948			
$PbCrO_4$	323.1	2.50934	Sb	120.2	2.07990
PbI_2	460.94	2.66365	Sb_2	240.4	2.38093
$PbMoO_4$	367.1	2.56478	$SbCl_3$	226.58	2.35522
$Pb(NO_3)_2$	331.12	2.51999	$SbCl_5$	297.50	2.47349
PbO	223.1	2.34850	$\frac{1}{2}Sb_2O_3$	144.2	2.15897
PbO_2	239.1	2.37858	Sb_2O_3	288.4	2.46000
Pb_3O_4	685.3	2.83588	Sb_2O_4	304.4	2.48344
PbS	239.17	2.37871	$\frac{1}{2}Sb_2O_5$	160.2	2.20466
$PbSO_4$	303.17	2.48169	Sb_2O_5	320.4	2.50569
			$SbOCl$	171.66	2.23467
Pd	106.7	2.02816	$SbOKC_4H_4O_6.$		
$PdCl_2.2H_2O$	213.65	2.32970	$\frac{1}{2}H_2O$	332.34	2.52158
PdI_2	360.54	2.55696	Sb_2S_3	336.61	2.52712
$Pd(NO_3)_2$	230.72	2.36309	Sb_2S_5	400.75	2.60287
Pt	195.2	2.29048	Se	79.2	1.89873
$PtCl_4$	337.04	2.52768	SeO_2	111.2	2.04610
$PtCl_4.5H_2O$	427.12	2.63055	SeO_3	127.2	2.10449
$PtCl_6$	407.96	2.61062			
			Si	28.3	1.45179
Rb	85.45	1.93171	Si_2	56.6	1.75282
Rb_2	170.90	2.23274	SiF_4	104.3	2.01828
$RbAl(SO_4)_2.$			SiF_6	142.3	2.15320
$12H_2O$	520.98	2.71682	SiO_2	60.3	1.78032
$RbCl$	120.91	2.08247	SiO_3	76.3	1.88252
$(RbCl)_2$	241.82	2.38350	SiO_4	92.3	1.96520
Rb_2CO_3	230.9	2.36342	Si_2O_7	168.6	2.22686
$RbHCO_3$	146.46	2.16554	$Si(OH)_4$	96.33	1.98376
$(RbHCO_3)_2$	292.92	2.46675			
Rb_2O	186.9	2.27161	Sn	119.0	2.07555
Rb_2PtCl_6	578.86	2.76258	$SnCl_2$	189.92	2.27858
Rb_2SO_4	266.97	2.42646	$SnCl_2.2H_2O$	225.95	2.35402
			$SnCl_4$	260.84	2.41638
Rh	102.9	2.01242	$SnCl_4.(NH_4Cl)_2$	367.84	2.56566
$RhCl_3$	209.28	2.32073	SnO	135.0	2.13033
			SnO_2	151.0	2.17898
S	32.07	1.50610	SnS	151.07	2.17918
S_2	64.14	1.80713	SnS_2	183.14	2.26278

Formula.	Formula Weight.	
	Number.	Logarithm.
Sr	87.63	1.94265
$SrCl_2$	158.55	2.20017
$SrCl_2.6H_2O$	266.65	2.42594
$SrCO_3$	147.63	2.16917
$\frac{1}{2}Sr(HCO_3)_2$	104.82	2.02044
$Sr(HCO_3)_2$	209.65	2.32149
$Sr(NO_3)_2$	211.65	2.32562
SrO	103.63	2.01550
$Sr(OH)_2.8H_2O$	265.77	2.42451
$SrSO_4$	183.70	2.26410
Ta	181.5	2.25888
$TaCl_5$	358.80	2.55485
$(TaCl_5)_2$	717.60	2.85588
Ta_2O_4	427.0	2.63012
Ta_2O_5	443.0	2.64572
Te	127.5	2.10551
TeO_2	159.5	2.20276
TeO_3	175.5	2.24428
$TeO_3.3H_2O$	229.55	2.36087
Th	232.40	2.36624
$ThCl_4$	374.24	2.57315
$Th(NO_3)_4.6H_2O$	588.54	2.76978
ThO_2	264.40	2.42226
Ti	48.1	1.68215
TiO_2	80.1	1.90363
Tl	204.00	2.30963
Tl_2	408.00	2.61066
TlCl	239.46	2.37923
$(TlCl)_2$	478.92	2.68026
$\frac{1}{2}Tl_2CO_3$	230.00	2.36922
Tl_2CO_3	468.00	2.67025
$\frac{1}{2}Tl_2CrO_4$	262.00	2.41830
Tl_2CrO_4	524.00	2.71933
$TlHSO_4$	301.08	2.47869
TlI	330.92	2.51973
$(TlI)_2$	661.84	2.82076
$TlNO_3$	266.01	2.42490
$\frac{1}{2}Tl_2$[illegible]	212.00	2.32634
Tl_2O	424.00	2.62737
Tl_2PtCl_6	815.96	2.91167
$\frac{1}{2}Tl_2SO_4$	252.04	2.40147
Tl_2SO_4	504.07	2.70249
U	238.5	2.37749
U_2	477.0	2.67852
UO_2	270.5	2.43217
$(UO_2)_2$	541.0	2.73320
$\frac{1}{3}U_3O_8$	281.17	2.44897
U_3O_8	843.5	2.92609
$UO_2(C_2H_3O_2)_2.2H_2O$	424.58	2.62796
$UO_2(UO_3)_2.6H_2O$	502.68	2.70129
$\frac{1}{2}U_2P_2O_{11}$	357.54	2.55332
$U_2P_2O_{11}$	715.08	2.85436
V	51.0	1.70757
VO_4	115.0	2.06070
$(VO_4)_2$	230.0	2.36173
V_2O_5	182.0	2.26007
W	184	2.26482
WO_2	216	2.33445
WO_3	232	2.36549
Yb	172	2.23553
Yb_2O_3	392	2.59329
Yt	89	1.94939
Yt_2O_3	226	2.35411
Zn	65.37	1.81538
$ZnCl_2$	136.29	2.13447
$ZnCO_3$	125.37	2.09819
ZnO	81.37	1.91046
$Zn_2P_2O_7$	304.82	2.48404
$\frac{1}{2}Zn_2P_2O_7$	152.41	2.18301
ZnS	97.44	1.98874
$ZnSO_4$	161.44	2.20801
$ZnSO_4.7H_2O$	287.55	2.45872
Zr	90.6	1.957[illegible]
ZrO_2	122.6	2.08[illegible]

CALCULATION OF VOLUMETRIC ANALYSES

VIII.—BASICITY OF ACIDS WITH VARIOUS INDICATORS ACCORDING TO R. T. THOMPSON *

The numbers indicate in each case the number of molecules of a univalent base, such as caustic soda, which will have combined with one molecule of the acid when the solution reacts neutral to the indicator given. Thomson divided indicators into three classes. Methyl orange is typical of the first class which also includes lacmoid, dimethyl amidobenzene, cochineal, iodeosine, and congo red. Phenolphthalein is typical of the second class which includes turmeric, curcuma, and flavescin. Litmus is typical of the third class, which includes rosolic acid, phenacetolin, fluorescein, gallein, and hematoxylin.

Acids.		Methyl Orange.	Phenolphthalein.		Litmus.	
Name.	Formula.	Cold.	Cold.	Boiling.	Cold.	Boiling.
Sulphuric........	H_2SO_4	2	2	2	2	2
Hydrochloric.....	HCl	1	1	1	1	1
Nitric...........	HNO_3	1†	1	1	1	1
Thiosulphuric....	$H_2S_2O_3$	2	2	2	2	2
Carbonic........	H_2CO_3	0	1 dilute	0	....	0
Sulphurous......	H_2SO_3	1	2	......	....	.....
Hydrosulphuric...	H_2S	0	1 dilute	0	....	0
Phosphoric.......	H_3PO_4	1	2	......	....	.....
Arsenic..........	H_3AsO_4	1	2	......	....	.....
Arsenous........	H_3AsO_3	0	....	......	0	0
Nitrous..........	HNO_2	†	1	......	1	.....
Silicic...........	H_4SiO_4	0	....	......	0	0
Boric...........	H_3BO_3	0	....	......	....	.....
Chromic........	H_2CrO_4.	1	2	2	....	.....
Oxalic..........	$H_2C_2O_4$	....	2	2	2	2
Acetic..........	$HC_2H_3O_2$	....	1	......	1 nearly	.....
Butyric.........	$HC_4H_7O_2$	....	1	......	1 nearly	.....
Succinic........	$H_2C_4H_4O_4$	....	2	......	2 nearly	.....
Lactic..........	$HC_3H_5O_3$	....	1	......	1	.....
Tartaric........	$H_2C_4H_4O_6$	....	2	......	2	.....
Citric..........	$H_3C_6H_5O_6$	....	3	......	....	.....

* C. N., **47**, pp. 123, 185; **49**, pp. 32, 119. J. S. C. I., **6**, p. 195.

† Concentrated nitric acid sometimes contains oxides of nitrogen producing on dilution nitrous acid, which destroys methyl orange

IX.—VALUE OF NORMAL SOLUTIONS OF ACIDS AND BASES

In the following table the amount of each chemical compound which is equal to one c.c. of a normal solution is given. The indicator given in the last column or an indicator belonging to the same class, as given by Thompson, must be used. When no indicator is specified any one of the three classes of indicators may be used.

For fifth or tenth normal solutions or other strengths the number given in the table must be multiplied by $\frac{1}{5}$ or $\frac{1}{10}$ or the number expressing in terms of normal the strength of the solution used. If the amount of any chemical compound corresponding to 100 c.c. is weighed out and titrated with a normal solution the number of c.c. of solution used will be equal to the percentage of the constituent titrated. If a one tenth normal solution is used only one tenth of this amount need be weighed out.

Substance.	Formula.	Atomic or Molecular Weight.	Grams Neutralized by 1 c.c. Normal Solution.		Indicator. *
			Number.	Logarithm.	
Acetic acid	$H.C_2H_3O_2$	60.032	.06003	$\bar{2}.77838$	P
Ammonia	NH_3	17.034	.01703	$\bar{2}.23132$	M., L.
Ammonium	NH_4	18.042	.01804	$\bar{2}.25624$	M., L.
chloride	NH_4Cl	53.502	.05350	$\bar{2}.72835$	M., L.
hydroxide	NH_4OH	35.05	.03505	$\bar{2}.54469$	M., L.
nitrate	NH_4NO_3	80.052	.08011	$\bar{2}.90370$	M., L.
sulphate	$(NH_4)_2SO_4$	132.154	.06608	$\bar{2}.82007$	M., L.
Barium	Ba	137.37	.06869	$\bar{2}.83689$	......
carbonate	$BaCO_3$	197.37	.09869	$\bar{2}.99427$	M.
chloride	$BaCl_2.2H_2O$	244.322	.12216	$\bar{1}.08693$	......
hydroxide	$Ba(OH)_2$	171.386	.08570	$\bar{2}.93298$	......
oxide	BaO	153.37	.07669	$\bar{2}.88474$	......
Boric acid	H_3BO_3	62.024	.06202	$\bar{2}.79256$	P.
Calcium	Ca	40.07	.02004	$\bar{2}.30190$	......
carbonate	$CaCO_3$	100.07	.05004	$\bar{2}.69932$	M.
chloride	$CaCl_2$	110.99	.05550	$\bar{2}.74429$	......
chloride	$CaCl_2.6H_2O$	219.086	.10954	$\bar{1}.03957$	......
hydroxide	$Ca(OH)_2$	74.086	.03704	2.56876	......
oxide	CaO	56.07	.02804	2.44778	......
Carbon dioxide	CO_2	44.00	.04400	$\bar{2}.64345$	P.
Citric acid	$H_3C_6H_5O_7$	192.064	.06402	$\bar{2}.80633$	......
Hydrobromic acid	HBr	80.928	.08093	$\bar{2}.90811$	......
Hydrochloric acid	HCl	36.468	.03647	$\bar{2}.56194$	......

* M. = Methyl orange; L. = Litmus; P. = Phenolthalein.

Substance.	Formula.	Molecular or Atomic Weight.	Grams Neutralized by 1 c.c. Normal Solution.		Indicator.
			Number.	Logarithm.	
Hydroiodic acid....	HI..........	127.928	.12793	$\bar{1}$.10697	......
Lactic acid.........	$H.C_3H_5O_3$.....	90.048	.09005	$\bar{2}$.95447	P.
Lead..............	Pb..........	207.10	.10355	$\bar{1}$.01515	......
carbonate........	$PbCO_3$.......	267.10	.13355	$\bar{1}$.12561	M.
oxide............	PbO.........	223.10	.11155	$\bar{1}$.04747	......
Magnesium.........	Mg..........	24.32	.01216	$\bar{2}$.08493	M.
carbonate........	$MgCO_3$.......	84.32	.04216	$\bar{2}$.62490	M.
chloride..........	$MgCl_2$........	95.24	.04762	$\bar{2}$.67779	M.
oxide............	MgO.........	40.32	.02016	$\bar{2}$.30449	M.
Nitric acid.........	HNO_3........	63.018	.06302	$\bar{2}$ 79948	......
oxide............	N_2O_5.........	108.02	.05401	$\bar{2}$.73247	......
Nitrous acid........	HNO_2........	47.018	.04702	$\bar{2}$.67228	P.
Nitrogen...........	N...........	14.01	.01401	$\bar{2}$.14644	......
Oxalic acid.........	$H_2C_2O_4$.......	90.016	.04501	$\bar{2}$.65329	......
" "	$H_2C_2O_4.2H_2O$.	126.048	.06302	$\bar{2}$.79951	......
Phosphoric acid.....	H_3PO_4.......	98.064	.09806	$\bar{2}$.99151	M.
" "	H_3PO_4.......	98.064	.04903	2.69048	P.
Potassium..........	K...........	39.10	.03910	2.59218	......
bicarbonate.......	$KHCO_3$......	100.108	.10011	$\bar{1}$.00048	M.
bitartrate........	$KHC_4H_4O_6$....	188.14	.18814	$\bar{1}$.27448	P.
carbonate........	K_2CO_3.......	138.20	.06910	$\bar{2}$.83948	M.
dichromate.......	$K_2Cr_2O_7$......	294.20	.14710	$\bar{1}$.16761	P.
hydroxide........	KOH........	56.108	.05611	$\bar{2}$.74904	......
oxide............	K_2O...	94.20	.04710	$\bar{2}$.67302	......
tartrate..........	$K_2C_4H_4O_6$.....	226.232	.11312	$\bar{1}$.05354	......
tetroxalate.......	$KH_3(C_2O_4)_2$.	254.16	.08472	$\bar{2}$.92799	......
Sodium............	Na.... [$2H_2O$	23.00	.02300	$\bar{2}$.36173	......
bicarbonate	$NaHCO_3$......	84.008	.08401	$\bar{2}$.92433	M.
carbonate........	Na_2CO_3.......	106.00	.05300	$\bar{2}$.72428	M.
diphosphate......	Na_2HPO_4.....	142.048	.14205	$\bar{1}$.15244	P.
"	Na_2HPO_4......	358.24	.35824	$\bar{1}$.55417	P.
hydroxide........	NaOH.[$12H_2O$	40.008	.04001	$\bar{2}$.60217	......
oxide............	Na_2O........	62.00	.03100	$\bar{2}$.49136	......
tetraborate.......	$Na_2B_4O_7$......	202.00	.10100	$\bar{1}$.00432	P.
"	$Na_2B_4O_7.10H_2O$	382.16	.19108	$\bar{1}$.28157	P.
triphosphate......	Na_3PO_4.......	164.04	.16404	$\bar{1}$.21495	M.
"	Na_3PO_4.......	164.04	.08202	$\bar{2}$.91392	P.
Sulphur trioxide.....	SO_3..........	80.07	.04004	$\bar{2}$.60249	......
Sulphuric acid	H_2SO_4........	98.086	.04904	$\bar{2}$.69053	......
Tartaric acid........	$H_2C_4H_4O_6$.....	150.048	.07502	$\bar{2}$.87520	P.

X.—VALUE OF NORMAL SOLUTIONS OF OXIDIZING AND REDUCING AGENTS

Substance Titrated.		Atomic or Molecular Weight.	1 c.c. of Normal Solution is Equal to Grams.	
Name.	Formula.		Number.	Logarithm.
Ammonium oxalate	$(NH_4)_2C_2O_4$	124.084	.06204	$\bar{2}.79267$
Antimony	Sb	120.2	.06010	$\bar{2}.77887$
Arsenic	As	74.96	.03748	$\bar{2}.57380$
Arsenous acid	H_3AsO_3	125.984	.06299	$\bar{2}.79927$
oxide	As_2O_3	197.04	.04926	$\bar{2}.69249$
sulphide	As_2S_3	246.13	.06153	$\bar{2}.78909$
Barium peroxide	BaO_2	169.37	.08469	$\bar{2}.92783$
peroxide	$BaO_2.8H_2O$	313.498	.15675	$\bar{1}.19521$
thiosulphate	$BaS_2O_3.H_2O$	267.526	.26753	$\bar{1}.42737$
Bleaching powder	$CaOCl_2$	126.99	.06349	$\bar{2}.80271$
Bromine	Br	79.92	.07992	$\bar{2}.90266$
Calcium	Ca	40.07	.02004	$\bar{2}.30190$
carbonate	$CaCO_3$	100.07	.05004	$\bar{2}.69932$
oxide	CaO	56.07	.02804	$\bar{2}.44778$
Chlorine	Cl	35.46	.03546	$\bar{2}.54974$
Chromic anhydride	CrO_3	100.0	.03333	$\bar{2}.52284$
oxide	Cr_2O_3	152.0	.02533	$\bar{2}.40364$
Copper	Cu	63.57	.06357	$\bar{2}.80325$
oxide	CuO	79.57	.0796	$\bar{2}.90091$
sulphate	$CuSO_4$	159.64	.15964	$\bar{1}.20314$
"	$CuSO_4.5H_2O$	249.72	.24972	$\bar{1}.39745$
Ferric oxide	Fe_2O_3	159.68	.07984	$\bar{2}.90222$
Ferrous oxide	FeO	71.84	.0719	$\bar{2}.85673$
sulphate	$FeSO_4.7H_2O$	278.031	.27803	$\bar{1}.44409$
ammonium sulphate	$FeSO_4(NH_4)_2SO_4.6H_2O$	392.16	.39222	$\bar{1}.59353$
Hydrogen peroxide	H_2O_2	34.016	.01701	$\bar{2}.23065$
Hydrogen sulphide	H_2S	34.086	.01704	$\bar{2}.23142$
Iodine	I	126.92	.12692	$\bar{1}.10353$
Iron	Fe	55.84	.05584	$\bar{2}.74695$
Lead peroxide	PbO_2	239.10	.11955	$\bar{1}.07755$
Manganese peroxide	MnO_2	86.93	.04346	$\bar{2}.63809$
Nitrous acid	HNO_2	47.018	.04702	$\bar{2}.67228$
Oxalic acid	$H_2C_2O_4$	90.016	.04501	$\bar{2}.65329$
"	$H_2C_2O_4.2H_2O$	126.048	.06302	$\bar{2}.79951$

Substance Titrated.		Atomic or Molecular Weight.	1 c.c. of Normal Solution is Equal to Grams.	
Name.	Formula.		Number.	Logarithm.
Potassium acid iodate...	$KH(IO_3)_2$..........	389.94	.03249	$\bar{2}$.51175
chlorate..............	$KClO_3$.............	122.56	.02043	$\bar{2}$.31033
chromate.............	K_2CrO_4............	194.2	.06473	$\bar{2}$.81111
dichromate...........	$K_2Cr_2O_7$...........	294.2	.04903	$\bar{2}$.69046
ferrocyanide..........	$K_4Fe(CN)_6$........	368.30	.36830	$\bar{1}$.56620
" cryst.....	$K_4Fe(CN)_6.3H_2O$...	422.48	.42248	$\bar{1}$.62581
iodate................	KIO_3..............	214.02	.03567	$\bar{2}$.55230
nitrite...............	KNO_2.............	85.11	.08511	$\bar{2}$.92998
perchlorate...........	$KClO_4$.............	138.56	.01732	$\bar{2}$.23855
permanganate.........	$KMnO_4$............	158.03	.03160	$\bar{2}$.49969
tetroxalate...........	$KH_3(C_2O_4)_2.2H_2O$..	254.16	.06354	$\bar{2}$.80305
Sodium chlorate.........	$NaClO_3$............	106.46	.01774	$\bar{2}$.24895
ferrocyanide..........	$Na_4Fe(CN)_6$.......	303.90	.30390	$\bar{1}$.48273
thiosulphate..........	$Na_2S_2O_3.5H_2O$......	248.22	.24822	$\bar{1}$.39484
Stannous chloride.......	$SnCl_2$..............	189.92	.09496	$\bar{2}$.97754
"	$SnCl_2.2H_2O$........	225.952	.11298	$\bar{1}$.05300
Tin....................	Sn.................	119.0	.0595	$\bar{2}$.77452

XI.—VALUE OF NORMAL SOLUTIONS OF PRECIPITATION REAGENTS

Substance Titrated.		Atomic or Molecular Weight.	1 c.c. of Normal Solution is Equal to Grams.	
Name.	Formula.		Number.	Logarithm.
Ammonium sulphocyanate	NH_4CNS	76.12	.07612	$\bar{2}.88150$
Arsenic acid	H_3AsO_4	141.98	.04733	$\bar{2}.67514$
oxide	As_2O_5	229.92	.03832	$\bar{2}.58343$
Arsenous acid	H_3AsO_3	125.98	.04199	$\bar{2}.62315$
oxide	As_2O_3	197.92	.03299	$\bar{2}.51838$
Bromine	Br	79.92	.07992	$\bar{2}.90266$
Carbon dioxide	CO_2	44.00	.02200	$\bar{2}.34242$
Chlorine	Cl	35.46	.03546	$\bar{2}.54974$
Copper	Cu	63.57	.06357	$\bar{2}.80325$
oxide	CuO	79.57	.07957	$\bar{2}.90075$
sulphate	$CuSO_4$	159.64	.15964	$\bar{1}.20314$
"	$CuSO_4.5H_2O$	249.72	.24972	$\bar{1}.39745$
Cyanogen	CN	26.01	.02601	$\bar{2}.41514$
Hydrobromic acid	HBr	80.928	.08093	$\bar{2}.90811$
Hydrochloric acid	HCl	36.468	.03647	$\bar{2}.56194$
Hydrocyanic acid	HCN	27.018	.02702	$\bar{2}.43169$
Hydroiodic acid	HI	127.928	.12793	$\bar{1}.10697$
Iodine	I	126.92	.12692	$\bar{1}.10353$
Potassium bromide	KBr	119.02	.11902	$\bar{1}.07562$
chloride	KCl	74.56	.07456	$\bar{2}.87251$
cyanide	KCN	65.11	.06511	$\bar{2}.81365$
iodide	KI	166.03	.16603	$\bar{1}.22019$
sulphide	K_2S	110.27	.05513	$\bar{2}.74139$
sulphocyanate	KCNS	97.18	.09718	$\bar{2}.98758$
Silver	Ag	107.88	.10788	$\bar{1}.03294$
nitrate	$AgNO_3$	169.89	.16989	$\bar{1}.23017$
Sodium bromide	NaBr	102.92	.10292	$\bar{1}.01250$
chloride	NaCl	58.46	.05846	$\bar{2}.76686$
cyanide	NaCN	49.01	.04901	$\bar{2}.69029$
iodide	NaI	149.92	.14992	$\bar{1}.17586$
sulphide	Na_2S	78.07	.03903	$\bar{2}.59140$
Zinc	Zn	65.37	.0327	$\bar{2}.51455$
oxide	ZnO	81.37	.0407	$\bar{2}.60959$
sulphate	$ZnSO_4$	161.44	.08072	$\bar{2}.90698$
"	$ZnSO_4.7H_2O$	287.55	.14377	$\bar{1}.15767$

XII. — PHYSICAL AND CHEMICAL CONSTANTS OF OILS. By Albert F. Seeker

Name.	°C.	Specific Gravity.*	Solidifying Point, °C.	Hehner Value.
Almond	15°	0.9175–0.9195	−10 to −20	96.2
Beech nut	15°	0.9200–0.9225	−17	95.2
Black mustard	15°	0.916–0.920	−17	95.1
Candlenut	15.5°	0.920–0.926	below −18	95.5
Castor	15.5°	0.9600–0.9679	−10 to −18	....
Cherry laurel	15°	0.9230	−19 to −20	....
Cocoanut	40°	0.9115	22–14	88.6–90
Cod liver	15°	0.9210–0.9280	0 to −10	95.3–97.5
Corn (Maize)	15.5°	0.9213–0.9250	−10 to −15	93–96
Cottonseed	15°	0.9220–0.9250	−1 to 0	95–96
Croton	15°	0.9375–0.9428	−16	89.0
Fir seed	15°	0.9215–0.9285	−18 to −30	....
Grape seed	15°	0.9350–0.9260	−10 to −13	92
Hazel nut	15°	0.9146–0.9170	−10 to −20	95.6
Hemp seed	15°	0.9255–0.9280	−27	....
Herring	15.5°	0.9202–0.9390	....	95.6
Lard oil	15.5°	0.9148–0.9175	−4 to +10	96.2
Linseed	15°	0.9310–0.9380	−17 to −27	95.5
Menhaden	15.5°	0.927–0.933	−4	....
Neat's foot	15°	0.9133–0.9174	0 to 1.5	....
Olive	15.5°	0.9140–0.9180	−6 to 2	95
Olive kernel	15°	0.9184–0.9191	....	....
Palm	15°	0.9210–0.9470	....	91–95
Palm nut	40°	0.9119	20.5 to 24	87.6–96
Peach kernel	15°	0.9180–0.9215	below −20	....
Peanut (Arachis)	15.5°	0.9110–0.9220	−3 to +3	95.8
Poppy seed	15.5°	0.9240–0.9270	−18	95.2
Porpoise (body oil)	15°	0.9258–0.9350	−16	85.5
Porpoise (jaw oil)	15°	0.9258	....	70.2
Pumpkin seed	15°	0.920–0.925	−15.5	96.2
Rape (Colza)	15.5°	0.9132–0.9168	−2 to −10	95.1
Safflower	15.5°	0.9251–0.9280	−13 to −18	95.4
Sardine	15°	0.9274–0.9330	....	95–97
Seal	15°	0.9155–0.9263	−2 to −3	95.45
Sesame	15.5°	0.9210–0.9244	−5	95.7
Shark liver (Arctic)	15°	0.9163–0.9290	....	86.9
Soja bean	15°	0.924–0.929	−15 to 8	94–96
Sperm oil [nose)	15°	0.8781–0.8835	15.5	....
Sperm Oil, Arctic (Bottle-	15°	0.8764	....	....
Sunflower	15°	0.9240–0.9258	−18.5	95.0
Tung (Chinese Wood oil)	15°	0.9360–0.9432	below −17	96.2
Walnut (Nut)	15°	0.9250–0.9260	−15 to −27	95.4
Whale	15.5°	0.922–0.926	below −2	93.5
White Mustard	15.5°	0.914–0.916	−8 to −16	96.2

* Water at 15.5° = 1.

Name.	Saponification Value.	Iodine Value.	Maumené Number.	°C.	Refractive Index.
Almond	189–195	93–104	51–54	25	1.4685–1.4693
Beech nut	191–196	111–120	64	....	....
Black mustard	174–176	96–117	43	15.5	1.4740–1.4770
Candlenut	189–195	153–164	....	25	1.4760
Castor	177–186	83–88.5	46–47	15	1.4799–1.4803
Cherry laurel	194	108.9	44.5	....	....
Cocoanut	246–268	8–12	21	40	1.4481–1.4497
Cod liver	182–189	135–168(181)	102–113	15	1.4790–1.4822
Corn (Maize)	188–193	113–129	74–86	15.5	1.4760–1.4768
Cottonseed	191–195	106–115	55–77	15.5	1.4737–1.4757
Croton	210–215	102–107	....	27	1.4757–1.4768
Fir seed	191.3	119.5	98.5	....	....
Grape seed	178.5	96	53	....	....
Hazel nut	192	83–90	36	....	....
Hemp seed	192.5	148–160	97	....	....
Herring	167–194	123.5–142	....	....	....
Lard oil	195–198	65–80	40–47	15.5	1.4702–1.4720
Linseed	190–195	171–201	103–126	15	1.4820–1.4852
Menhaden	189–193	139–173	....	25	1.4787
Neat's foot	192–197	66–73.2	47–58.5	15	1.4695–1.4708
Olive	189–196	77.5–91	35–52	15.5	1.4703–1.4718
Olive kernel	183	82–87	....	25	1.4682–1.4688
Palm	196–205	51.5–57	....	60	1.4510
Palm nut	242–250	10–17	....	60	1.4431
Peach kernal	189–193	93–109	42.5	25	1.4697–1.4705
Peanut (Arachis)	186–197	85–103	44–67	15.5	1.4707–1.4731
Poppy seed	189–197	133–157.5	71–88	15.5	1.4766–1.4774
Porpoise (body oil)	195–224.8	110–120	50	25	1.4677
Porpoise (jaw oil)	254–272	22–50	....	....	....
Pumpkin seed	188.4–195	121–130	....	25	1.4724–1.4738
Rape (Colza)	167–179	93–104	50–67	15.5	1.4720–1.4752
Safflower	186.6–193	129.8–150	....	40	1.4693
Sardine	189–193	160–193	....	20	1.4802–1.4808
Seal	189–196	127–159	....	25	1.4741
Sesame	188–193	103–114	61–68.5	15.5	1.4748–1.4762
Shark liver (Arctic)	161–188.5	114–143.5	....	....	....
Soja bean	190–200	121–139	59–61	15.5	1.4760–1.4775
Sperm oil .... [nose)	123–147	81–90	51	15.5	1.4665–1.4672
Sperm oil, Arctic (Bottle-	123–135.9	67–82.1	41–47	....	....
Sunflower	188–194	119–135	60–75	25	1.4736
Tung (Chinese Wood oil)	190–197	150–165	....	19	1.503
Walnut (Nut)	195	142–152	103	40	1.4690
Whale	188–194	110–128	....	25	1.4723
White Mustard	170–176	92–97	44–49	40	1.4649

Name.	Acid Value.	% Unsaponifiable Matter.	Other Values.
Almond	1.5	....	....
Black mustard	1.36–7.35	....	....
Candlenut	8.1	0.76	....
Castor	0.14–14.61	....	Acl. V. 153–156*
Cocoanut	5–50	....	R.M. 6.8–8.4 P.V. 12–18
Cod liver	0.36–25	0.54–9.87	Acl. V. 4–8
Corn (Maize)	1.7–20.6	1.35–2.86	....
Cottonseed	0.0	0.73–1.64	Acl. V. 7.6–18
Croton	....	0.55	R.M. 12–13.6 Acl. V. 20–39
Grape seed	16.2	....	Acl. V. 144.5
Hazel nut	....	0.5	....
Hemp seed	....	1.08	....
Herring	1.8–44	0.99–10.7	....
Lard oil	....	....	....
Linseed	0.8–8.4	0.42–1.9	....
Menhaden	3–11.6	1.6–6.7	....
Neat's foot	....	....	Acl. V. 22.0
Olive	1.9–50	0.46–1.0	....
Olive kernel	2–3.5	....	....
Palm	24–200	....	R.M. 0.7–1.9
Palm nut	8.4	....	R.M. 5–6.8
Peanut (Arachis)	1.2–32	0.54–0.94	....
Poppy seed	0.7–11.0	0.43	....
Porpoise (body oil)	1.2	3.7	R. No. 23.5
Porpoise (jaw oil)	5.0	16.4	R. No. 47.8–65
Rape (Colza)	1.4–13.2	0.58–1.0	....
Safflower	0.33–20	....	Acl. V. 16.1
Sardine	4–25	0.5–1.4	....
Seal	1.9–40	0.38–1.4	Acl. V. 33–34
Sesame	0.2–46	0.95–1.32	....
Shark liver (Arctic)	3–7	5.46–10.2	....
Sperm oil	13.2	37–41	M. Pt. 25.5–25.7
Sperm oil, Arctic (Bottlenose)	....	31.7–42.6	M. Pt. 23.5–26.5
Sunflower	11.2	0.31	....
Tung (Chinese Wood oil)	7.6–12	0.44	....
Whale	0.5–37	0.92–3.72	†Acl. V. 11.6–17.2
White Mustard	5.4	....	....

* Polarizes (200 mm.) +21.9 to + 28°V. † Old oil has acetyl value at 23.

Acl. V. = Acetyl Value.
R.M. = Reichert-Meissl Value.
R. No. = Reichert Value.
M. Pt. = Melting Point.
P.V. = Polenske Value.

Name.	Mixed Fatty Acids.			
	Melting Point, °C.	Acid Value.	Iodine Value.	Other Values.
Almond	13–14	196–207	93–96.5	R.I. (60°) 1.4461
Beech nut	23–24	....	114	....
Black mustard	16	187.1	109.6	....
Candlenut	20–21	....	....	....
Castor	13	192.1	87–93	R.I. (60°) 1.4546
Cherry laurel	20–22	....	112.1	....
Cocoanut	25–27	258–273	8.4–9.3	R.I. (60°) 1.4295
Cod liver	21–25	204–207	130.5–170	R.I. (60°) 1.4521
Corn (Maize)	17–23	198.4	113–126	....
Cottonseed	34–40	202–208	111–115	R.I. (60°) 1.4460
Croton	18.6–19	201	111.5	S.P. 16.7–19
Fir seed	16–19	....	121.5	....
Grape seed	24	187.4	99	....
Hazel nut	17–24	200.6	91.3–97.6	....
Hemp seed	18–19	....	141	....
Herring	....	178.5	....	....
Lard oil	33.2–38.4	....	....	....
Linseed	17–24	197	179–192	R.I. (60°) 1.4546
Neat's foot	28.5–30.8	....	62–76	....
Olive	19.2–31.0	193–198	86–90	R.I. (60°) 1.4410
Palm	47–50	204–207	53.3	Titer 36–45.5
Palm nut	25–28.5	258–264	12.0	R.I. (60°) 1.4310
Peach kernel	10–18	200.9	94–101	....
Peanut (Arachis)	26–36.4	201.6	96–103	R.I. (60°) 1.4461
Poppy seed	20–25.8	199	139	R.I. (60°) 1.4506
Porpoise (body oil)	....	207	126	R.I. (25°) 1.4622
Pumpkin seed	28–29	197	133.6	....
Rape (Colza)	17–22	185	99–106	R.I. (60°) 1.4991
Safflower	17	199	148	Titer 16° C.
Sardine	28–36	177–185	....	....
Seal	22–33	193.2	....	....
Sesame	26–32	200.4	110–116	R.I. (60°) 1.4461
Soja bean	22–31	198	115–140	....
Sperm oil............[nose)	13.3	23.6	83.2–85.6	F.A. 60–64%
Sperm oil, Arctic (Bottle-	10.3–10.8	......	82.7	F.A. 61–65%
Sunflower	22–24	201.6	124–134	R.I. (60°) 1.4531
Tung (Chinese Wood oil)	31–43.8	189–198	144–159	....
Walnut (Nut)	16–20	200.2	150	....
Whale	14–27.0	....	131.2	....
White Mustard	15–16	185.8	95.3	....

R.I. = Refractive Index. S.P. = Solidifying Point. F.A. = Fatty Acids.

XIII. — PHYSICAL AND CHEMICAL CONSTANTS OF FATS AND WAXES

By Albert F. Seeker

Name.	°C.	Specific Gravity.*	Solidifying Point, °C.	Hehner Value.	Saponification Value.
Beef marrow	15	0.9311–0.9380	31–29	....	196–199
Beef tallow	15	0.943–0.952	27–38	95.6	193.2–200
Beeswax	15	0.958–0.970	60.5–62.8	....	90–102
Bone fat	15	0.914–0.916	15–17	....	190.9
Butter fat	40	0.904–0.908	20–23	86.5–89.8	216–233
Carnaüba wax	15	0.990–0.999	80–87	....	79–95
Chicken fat	15	0.9241	21–27	....	193.5
Chinese wax (insect wax)	15	0.926–0.970	80.5–81	....	78–93
Cocoa butter	15	0.9500–0.9760	21.5–23	94.6	192–202
Cottonseed Stearine	15	0.9188–0.9230	16–22	95.9	195
Dog fat	15	0.9229	20–26	95	195.4
Goose (domestic)	15	0.9274–0.9227	18–20	95	193.1
Goose (wild)	15	0.9158	18–20	....	196
Hare fat	15	0.9288–0.9397	17–23	95.4	198–206
Horse fat	15	0.916–0.922	20–45	95–96	195–200
Human fat	25	0.9033	15	....	193–200
Japan wax	15	0.9700–0.9800	48.5–53	90.6	210–222
Lard	100	0.859–0.864	27.1–29.9	93–96	193–200
Laurel oil	15	0.9332	25	....	197.9
Mutton tallow	15	0.937–0.952	32–41	95.5	192–195.2
Myrtle wax	15	0.995	39–43	....	206–217
Nutmeg butter (Mace butter)	15	0.945–0.996	41–42	....	154–191
Rabbit fat (tame)	15	0.9342	22–24	95.5	202.6
Rabbit fat (wild)	15	0.9393	17–22	....	199.3
Spermaceti	15	0.905–0.960	42–47	....	123–135
Vegetable tallow (Chin.)	15	0.9180–0.9186	27–31	93	198–206
Wool fat (purified)	17	0.9322–0.9449	38–40	91	84–127

* Water at 15.5° = 1.

XIII. — Physical and Chemical Constants of Fats and Waxes — (*Continued*)

Name.	Iodine Value.	° C.	Refractive Index.	Acid Value.	% Unsaponifiable Matter.
Beef marrow	39–55.4	..	....	1.6	....
Beef tallow	35–46	40	1.4586	3.5–50	....
Beeswax	7.9–13.8	75	1.4398–1.4451	16.8–21.2	52–55*
Bone fat	46–55.8	..	....	29.6–53	0.5–1.8
Butter fat	26–38	25	1.4590–1.4620	0.45–35.4	0.33–0.56
Carnaüba wax	13.5	84	1.4520–1.4541	4–7	55*
Chicken fat	58–77	..	....	1.2	....
Chinese wax (insect wax)	1.4	..	....	traces	....
Cocoa butter	32–41	60	1.4496	1.1–1.88	....
Cottonseed Stearine	90–103	..	....	....	....
Dog fat	58.5(41–83)	..	....	1.79	....
Goose (domestic)	58–71	40	1.4593–1.4596	0.59	....
Goose (wild)	99.6	..	....	0.86	....
Hare fat	81–119	40	1.4586	2.73	....
Horse fat	71–86	40	1.4603–1.4717	0.0–2.44	....
Human fat	57–73		....	....	....
Japan wax	5–12	65	1.4477–1.4492	7.33	1.1–1.63
Lard	50–70	40	1.4584–1.4601	0.54–1.28	0.23
Laurel oil	68–80	..	....	26.3	....
Mutton tallow	35–46	60	1.4510	1.7–14.0	....
Myrtle wax	1–10.7	..	....	3–4.4	....
Nutmeg butter (Mace butter)	40–52	40	1.4700–1.4812	17–44.8	....
Rabbit fat (tame)	67.6	40	1.4586	6.2	....
Rabbit fat (wild)	99.8	..	....	7.2	....
Spermaceti	3.8–9.5†	..	....	0.5–1.35†	51.5*
Vegetable tallow (Chinese)	28–50	..	....	2.2–7.5	....
Wool fat	15–18	40	1.4781–1.4822	....	43.1–51.8*

* Plus Alcohols.

† Commercial Samples.

XIII. — Physical and Chemical Constants of Fats and Waxes — (*Concluded*)

Name.	Other Values.	Mixed Fatty Acids.			
		Melting Point, °C.	Acid Value.	Iodine Value.	Other Values.
Beef marrow	....	44–46	204.5	44–56	......[46.2
Beef tallow	....	43–44	197.2	41.3	Titer 37.9–
Beeswax	E.V. 72–78. R.V.3.5–4.2	....	......	....	....
Bone fat	Acl. V. 11.3	30	200	55.7–57.4	....
Butter fat	R.M.20.0–33 P.V.1.3–3.5	38–40	210–233	28–31	R.I. (60°) 1.437
Chicken fat	R. No. 1.0	38–40	200.8	64.6	Acl.V. 45.2
Cocoa butter	M. Pt. 28–33	48–52	190–198	33–39	R.I. (60°) 1.4220
Cottonseed Stearine	M. Pt. 30–40	27–45	......	94	Titer 42–44
Dog fat	....	39–40.5	199.2	50.2	....
Goose (domestic)	R. No. 0.98	35–41	202.4	65.3	....
Goose (wild)	R.M. 0.2–0.3	34–40	196.4	65.1	....
Hare fat	R. No. 1.59	44–47	209.0	88–98	R.I. (40°) 1.4495
Horse fat	M. Pt. 35–43	37.5–42	202.6	72–87	Titer 33.7
Human fat	.......[31.2	35.5	......	64	....
Japan wax	Acl. V. 27–	56–62	213.7	....	....
Lard	Acl. V. 2.6	40–47	201.8	64	R.I. (60°) 1.4395
Laurel oil	R. No. 1.6	....	......	81.8	Titer 15.1
Mutton tallow	....	46–54	210	34.8	Titer 40.15; 48.02
Myrtle wax. [butter)	....	47.5	230.9	....	....
Nutmeg butter (Mace	R.M. 1–4.2	42.5	......	....	Titer 35.9
Rabbit fat (tame)	R.No.2.8–5.6	40–42	218.1	64.4	R.I. (40°) 1.4495
Rabbit fat (wild)	R. No. 0.7	39–41	209.5	101.1	....
Spermaceti	Acl. V. 2.63	....	......	....	....
Vegetable tallow (Chinese)	M. Pt. 36–46	39–57	182–208	30–39	....
Wool fat	Acl.V.109-123 R.M. 8	41.8	......	17	....

E.V. = Ether Value = Saponification Value minus Acid Value.
R.V. = Ratio Value = Ether Value divided by Acid Value.
Acl. V. = Acetyl Value. M. Pt. = Melting Point.
R.M. = Reichert-Meissl Value. R.I. = Refractive Index.
R. No. = Reichert Value. P.V. = Polenske Value.

XIV.—PHYSICAL CONSTANTS OF LUBRICATING OILS

Lewkowitsch

Oil.	Specific Gravity.	Viscosity by Redwood's Viscosimeter. Standard for Viscosity; Sperm Oil at 70° C.=100.		Flash Point. Close Test.	Cold Test.
	60° F.	70° F.	120° F.	°F.	°F.
Refined Mineral Oils					
Scotch	0.890–0.895	100–130	40–50	320–350	32
Scotch	0.885–0.890	75–100	35–40	300–325	32
Scotch	0.875–0.880	50–60	25–30	300–325	32
American	0.915–0.920	400–425	90–100	375–425	32
American	0.905–0.910	200–225	55–65	350–400	32
American	0.885–0.890	75–100	35–40	325–350	32
American	0.875–0.880	65–75	30–35	325–350	32
Russian	0.910–0.915	1200–1500	200–250	400–425	25
Russian	0.905–0.912	700–800	125–150	350–375	25
Russian	0.895–0.900	220–250	60–65	325–350	15
Russian	0.895–0.900	125–175		300–325	10
Southern Sperm Oil	0.8807	100.1	45.4	457.5	41.7
Arctic Sperm Oil	0.8804	105.3	47.2	446.2	39.2
White Whale Oil	0.9207	187.7	71.3	476.0	27.2
Neat's Foot Oil	0.9178	247	82.4	470.3	34.4
Lard Oil	0.9172	223.2	79.4	493.9	39.6
Olive Oil	0.9167	213.2	75.0	437.5	27
Rape Oil, East India, refined	0.916	250.4	88.1	478.6	26.4
Rape Oil, Black Sea, refined	0.9209	226.9	78.8	465.4	27
Cottonseed Oil, refined	0.9235	190.4	69.8	523	30
Castor Oil	0.963	2500	390	487	0

XV.—PHYSICAL AND CHEMICAL CONSTANTS OF REPRESENTATIVE SAMPLES OF LUBRICATING OILS

By Albert F. Seeker

Name.	Sp. Gr. 60° F.	Flash Test °F.	Fire Test °F.	Cold Test °F.	Saponifiable Matter.*	Ash.	Acidity or Alkalinity.	Other Tests.
Air Compressor Oil	0.8857	455	525	25	trace	none	neutral	No rosin oil. Vis. 261.7.§
Air Compressor Oil	0.8654	410	460	−2	none	none	neutral	No rosin oil.
Car Oil	0.8824	354	400	5	none	none	neutral	T. S. M. 1%.†
Cutting Oil	0.9036	345	425	31	82.9%	none	3.16%‖	Mixture lard and min. oils. Vis. 8.6§
Cylinder Oil	0.8921	535	600¶	60	20%	trace	neutral	T. S. M. less than 5%.
Cylinder Oil	0.9020	545	600¶	31	2.4%	none	neutral	T. S. M. trace. Vol. 1.43%.‡
Cylinder Oil	0.8993	590	600¶	....	none	0.06%	neutral	T. S. M. none. Vol. 9.74%.‡
Cylinder Oil	0.8992	555	600¶	....	none	0.08%	neutral	T. S. M. 2%. Vol. 9.12%.‡
Engine Oil	0.9163	430	480	27	1.5%	trace	neutral	No rosin oil. Vis. 28.4.§
Engine Oil	0.8845	360	415	5	10%	none	0.05%‖	T. S. M. none.

TABLE XV. — LUBRICATING OILS (*Continued*)

Name.	Sp. Gr. 60° F.	Flash Test °F.	Fire Test °F.	Cold Test °F.	Saponifiable Matter.*	Ash.	Acidity or Alkalinity.	Other Tests.
Engine Oil	0.8970	400	465	3	none	none	neutral	T. S. M. none. No rosin oil.
Engine Oil	0.8810	405	470	14	none	0.02%	neutral	T. S. M. none. No rosin oil.
150° Fire Test Oil	0.7864	140	180	....	none	none	neutral	T. S. M. none.
300° Fire Test Oil	0.8206	266	300	32	none	none	neutral	T. S. M. none.
High Speed Engine Oil	0.9152	400	465	5	17.2%	0.06%	1.09%‖	T. S. M. none. No rosin oil.
High Speed Engine Oil	0.9149	400	475	3	15.3%	0.04%	1.06%‖	T. S. M. none. No rosin oil.
Ice Machine Oil	0.8941	430	495	−4	none	0.13%	neutral	T. S. M. trace. No rosin oil.
Machine Oil	0.8689	420	480	0	trace	none	neutral	No rosin oil. Vis. 11.7.§
Marine Engine Oil	0.8812	405	440	17	none	trace	neutral	No rosin oil.
Marine Engine Oil	0.8765	435	500	5	none	0.03%	neutral	No rosin oil.
Marine Engine Oil	0.9090	405	465	0	12.0%	0.15%	0.75%‖	No rosin oil.
Marine Machine Oil	0.9054	400	470	9	9.0%	0.11%	0.50%‖	No rosin oil.
Screw-Cutting Oil	0.9002	380	425	15	25%	none	1.02%‖	T. S. M. none.
Transformer Oil	0.8646	365	430	2	none	none	neutral	T. S. M. none.

* Saponifiable Matter. Obtain saponification value in usual way and calculate to rape oil, taking 175 as a mean value.

† T. S. M. = Tarry or suspended matter. Treat 5 c.c. of oil in a graduated tube with 100 c.c. 88° gasoline and allow to settle, reading off the sediment by the graduations.

‡ Vol. = Volatility. Heat 5 grams of oil in a tarred dish at 400° F. for 2 hours and calculate loss in weight to per cent.

‖ Calculated to oleic acid.

§ Viscosity. Taken at 70° F. in Engler viscosimeter, water at 70° F. = 1.

¶ Above.

XVI. — TEMPERATURE CORRECTION FOR REFRACTIVE INDICES OF OILS

Bul. No. 77, U. S. Dept. Agr.

Substance.	Correction for 1° C.	Substance.	Correction for 1° C.
Black mustard oil..	0.000361	Peanut oil	0.000366
Corn oil...........	0.000366	Poppyseed oil	0.000369
Cottonseed oil......	0.000368	Rape oil..	0.000364
Lard oil...........	0.000368	Sesame oil	0.000370
Mustard oil........	0.000360	Sunflower oil......	0.000368
Olive oil...........	0.000365		

XVII. — TEMPERATURE CORRECTION FOR SPECIFIC GRAVITY OF OILS AND FATS

Allen, Com. Org. Anal.

Substance.	Correction for 1° C.	Substance.	Correction for 1° C.
Butter fat.........	0.000617	Olive oil	0.000629
Cocoa butter.......	0.000717	Palm nut oil......	0.000657
Cocoanut oil.......	0.000642	Peanut oil	0.000655
Cod-liver oil.......	0.000646	Rape oil..........	0.000620
Cottonseed oil......	0.000629	Sesame oil........	0.000624
Lard..............	0.000650	Tallow...........	0.000675
Lard oil..........	0.000658	Whale oil..........	0.000697

XVIII. — CONVERSION OF ACID VALUE INTO OLEIC ACID

By Albert F. Seeker

Acid Value.	Oleic Acid, Per cent.	Acid Value.	Oleic Acid, Per cent.
1................	0.5027	6	3.0162
2................	1.0054	7	3.5189
3................	1.5081	8	4.0216
4................	2.0108	9	4.5243
5................	2.5135		

XIX.—TABLE FOR CALCULATING THE SPECIFIC GRAVITY OF OILS AT 15.5°*

C. H. Wright, Jour. Soc. Chem. Ind., **26**, 513.

Example: A = sp. gr. at 20°. A × 1.00319 = sp. gr. at 15.5° C.

Temperature.	Factor.	Temperature.	Factor.	Temperature.	Factor.	Temperature.	Factor.
10	$\frac{1}{1.00389}$	14	$\frac{1}{1.00106}$	18	1.00177	22	1.00462
11	$\frac{1}{1.00318}$	15	$\frac{1}{1.00035}$	19	1.00248	23	1.00534
12	$\frac{1}{1.00248}$	16	1.0035	20	1.00319	24	1.00605
13	$\frac{1}{1.00177}$	17	1.00106	21	1.00391	25	1.00677

XX.—POLENSKE VALUE OF BUTTER FAT

Zeit. Nahrungs und Genussm., **7**; 273 and **15**, 193.

E. Polenske			M. Fritzsche (Dutch Butter)		
Reichert-Meissl Value.	Polenske Value.	Maximum Limit.	Reichert-Meissl Value.	Polenske Value.	Maximum Limit.
20–21	1.3–1.7	2.1	24–25	1.6–1.7	2.0
21–22	1.4–1.8	2.2	25–26	1.7–1.8	2.2
22–23	1.5–1.9	2.3	26–27	1.8–1.9	2.4
24–25	1.7–1.8	2.3	27–28	1.9–2.0	2.7
25–26	1.8–1.9	2.4	28–29	2.0–2.2	2.8
26–27	1.9–2.0	2.5	29–30	2.2–2.4	3.0
27–28	2.0–2.2	2.7	30–31	2.4–2.5	3.2
28–29	2.2–2.5	3.0	31–32	2.4–2.5	3.2
29–30	2.5–3.0	3.5	32–33	2.5–2.7	3.4
....	....	....	33–34	2.5–2.7	3.4

* These factors may be used for the common fats and oils and are accurate enough for all except the most accurate work.

XXI.—CONVERSION OF BUTYRO-REFRACTOMETER READINGS TO INDICES OF REFRACTION.

By Albert F. Seeker

Butyro-R. Reading.	Index of Refraction.	Difference.	Butyro-R. Reading.	Index of Refraction.	Difference.	Butyro-R. Reading.	Index of Refraction.	Difference.
0......	1.4220	....	34......	1.4481	7	68.....	1.4710	6
1......	1.4228	8	35......	1.4488	7	69.....	1.4717	7
2......	1.4236	8	36......	1.4495	7	70.....	1.4723	6
3......	1.4244	8	37......	1.4502	7	71.....	1.4729	6
4......	1.4252	8	38......	1.4510	8	72.....	1.4736	7
5......	1.4260	8	39......	1.4517	7	73.....	1.4742	6
6......	1.4268	8	40......	1.4524	7	74.....	1.4748	6
7......	1.4276	8	41......	1.4531	7	75.....	1.4754	6
8......	1.4284	8	42......	1.4538	7	76.....	1.4760	6
9......	1.4292	8	43......	1.4545	7	77.....	1.4766	6
10......	1.4300	8	44......	1.4552	7	78.....	1.4772	6
11......	1.4308	8	45......	1.4559	7	79.....	1.4778	6
12......	1.4316	8	46......	1.4566	7	80.....	1.4783	5
13......	1.4324	8	47......	1.4573	7	81.....	1.4789	6
14......	1.4331	7	48......	1.4580	7	82.....	1.4795	6
15......	1.4339	8	49......	1.4587	7	83.....	1.4801	6
16......	1.4347	8	50......	1.4593	6	84.....	1.4807	6
17......	1.4354	7	51......	1.4600	7	85.....	1.4812	5
18......	1.4362	8	52......	1.4607	7	86.....	1.4818	6
19......	1.4370	8	53......	1.4613	6	87.....	1.4824	6
20......	1.4377	7	54......	1.4620	7	88.....	1.4829	5
21......	1.4385	8	55......	1.4626	6	89.....	1.4835	6
22......	1.4392	7	56......	1.4633	7	90.....	1.4840	5
23......	1.4400	8	57......	1.4640	7	91.....	1.4846	6
24......	1.4408	8	58......	1.4646	6	92.....	1.4851	5
25......	1.4415	7	59......	1.4653	7	93.....	1.4857	6
26......	1.4423	8	60......	1.4659	6	94.....	1.4862	5
27......	1.4430	7	61......	1.4666	7	95.....	1.4868	6
28......	1.4438	8	62......	1.4672	6	96.....	1.4873	5
29......	1.4445	7	63......	1.4679	7	97.....	1.4879	6
30......	1.4452	7	64......	1.4685	6	98.....	1.4884	5
31......	1.4460	8	65......	1.4691	6	99.....	1.4890	6
32......	1.4467	7	66......	1.4698	7	100.....	1.4895	5
33......	1.4474	7	67......	1.4704	6	....	....	....

XXII. — REDUCTION OF GAS. VOLUMES TO 0° AND 760 MM.

Volume at 0° and 750 mm. $= v\left(\dfrac{1}{760\ (1 + .00367\ t)}\right)$ and $(P - p)$.

v = observed volume of gas

t = observed temperature of gas in degrees Centigrade

P = observed barometric pressure, corrected, in millimeters

p = tension of aqueous vapor in millimeters

The logarithm of the volume at 0° and 76 mm. is obtained by adding the logs of v and $\left(\dfrac{1}{760\ (1 + .00367\ t)}\right)$ and $(P - p)$.

°C.	Logarithm of $\frac{1}{760(1+.00367t)}$	Tension aqueous vapor.	°C.	Logarithm of $\frac{1}{760(1+.00367t)}$	Tension aqueous vapor.	°C.	Logarithm of $\frac{1}{760(1+.00367t)}$	Tension aqueous vapor.
		mm.			mm.			mm.
0.	$\bar{3}.11919$	4.60	5.8	$\bar{3}.11004$	6.90	11.6	$\bar{3}.10108$	10.21
0.2	$\bar{3}.11887$	4.65	6.0	$\bar{3}.10973$	7.00	11.8	$\bar{3}.10178$	10.34
0.4	$\bar{3}.11855$	4.71	6.2	$\bar{3}.10942$	7.09	12.0	$\bar{3}.10047$	10.48
0.6	$\bar{3}.11824$	4.78	6.4	$\bar{3}.10911$	7.19	12.2	$\bar{3}.10017$	10.62
0.8	$\bar{3}.11792$	4.85	6.6	$\bar{3}.10880$	7.29	12.4	$\bar{3}.09986$	10.76
1.0	$\bar{3}.11760$	4.92	6.8	$\bar{3}.10848$	7.39	12.6	$\bar{3}.09956$	10.90
1.2	$\bar{3}.11728$	4.99	7.0	$\bar{3}.10818$	7.49	12.8	$\bar{3}.09925$	11.04
1.4	$\bar{3}.11696$	5.06	7.2	$\bar{3}.10786$	7.60	13.0	$\bar{3}.09895$	11.19
1.6	$\bar{3}.11665$	5.14	7.4	$\bar{3}.10755$	7.70	13.2	$\bar{3}.09864$	11.33
1.8	$\bar{3}.11633$	5.21	7.6	$\bar{3}.10724$	7.81	13.4	$\bar{3}.09834$	11.48
2.0	$\bar{3}.11601$	5.29	7.8	$\bar{3}.10693$	7.91	13.6	$\bar{3}.09804$	11.63
2.2	$\bar{3}.11570$	5.36	8.0	$\bar{3}.10662$	8.02	13.8	$\bar{3}.09773$	11.78
2.4	$\bar{3}.11538$	5.44	8.2	$\bar{3}.10631$	8.13	14.0	$\bar{3}.09743$	11.94
2.6	$\bar{3}.11507$	5.52	8.4	$\bar{3}.10600$	8.24	14.2	$\bar{3}.09713$	12.09
2.8	$\bar{3}.11475$	5.60	8.6	$\bar{3}.10570$	8.36	14.4	$\bar{3}.09682$	12.25
3.0	$\bar{3}.11443$	5.68	8.8	$\bar{3}.10538$	8.47	14.6	$\bar{3}.09652$	12.41
3.2	$\bar{3}.11412$	5.76	9.0	$\bar{3}.10508$	8.58	14.8	$\bar{3}.09622$	12.57
3.4	$\bar{3}.11380$	5.84	9.2	$\bar{3}.10477$	8.70	15.0	$\bar{3}.09592$	12.73
3.6	$\bar{3}.11349$	5.92	9.4	$\bar{3}.10446$	8.82	15.2	$\bar{3}.09561$	12.89
3.8	$\bar{3}.11317$	6.00	9.6	$\bar{3}.10415$	8.94	15.4	$\bar{3}.09531$	13.06
4.0	$\bar{3}.11286$	6.09	9.8	$\bar{3}.10384$	9.06	15.6	$\bar{3}.09501$	13.23
4.2	$\bar{3}.11255$	6.17	10.0	$\bar{3}.10354$	9.18	15.8	$\bar{3}.09471$	13.39
4.4	$\bar{3}.11223$	6.26	10.2	$\bar{3}.10323$	9.30	16.0	$\bar{3}.09441$	13.57
4.6	$\bar{3}.11192$	6.35	10.4	$\bar{3}.10292$	9.43	16.2	$\bar{3}.09411$	13.74
4.8	$\bar{3}.11160$	6.44	10.6	$\bar{3}.10262$	9.55	16.4	$\bar{3}.09381$	13.91
5.0	$\bar{3}.11129$	6.53	10.8	$\bar{3}.10231$	9.68	16.6	$\bar{3}.09351$	14.09
5.2	$\bar{3}.11098$	6.62	11.0	$\bar{3}.10200$	9.81	16.8	$\bar{3}.09321$	14.27
5.4	$\bar{3}.11067$	6.71	11.2	$\bar{3}.10170$	9.94	17.0	$\bar{3}.09291$	14.45
5.6		6.81	11.4	$\bar{3}.10139$	10.07	17.2	$\bar{3}.09261$	14.63

°C.	Logarithm of $\frac{1}{760(1+.00367t)}$	Tension aqueous vapor. mm.	°C.	Logarithm of $\frac{1}{760(1+.00367t)}$	Tension aqueous vapor. mm.	°C.	Logarithm of $\frac{1}{760(1+.00367t)}$	Tension aqueous vapor. mm.
17.4	$\bar{3}.09231$	14.82	23.4	$\bar{3}.08341$	21.39	29.4	$\bar{3}.07469$	30.48
17.6	$\bar{3}.09201$	15.00	23.6	$\bar{3}.08312$	21.65	29.6	$\bar{3}.07440$	30.84
17.8	$\bar{3}.09171$	15.19	23.8	$\bar{3}.08282$	21.91	29.8	$\bar{3}.07411$	31.19
18.0	$\bar{3}.09141$	15.38	24.0	$\bar{3}.08253$	22.18	30.0	$\bar{3}.07383$	31.56
18.2	$\bar{3}.09111$	15.58	24.2	$\bar{3}.08224$	22.45	30.2	$\bar{3}.07354$	31.92
18.4	$\bar{3}.09081$	15.77	24.4	$\bar{3}.08194$	22.72	30.4	$\bar{3}.07325$	32.29
18.6	$\bar{3}.09051$	15.97	24.6	$\bar{3}.08165$	22.99	30.6	$\bar{3}.07297$	32.66
18.8	$\bar{3}.09021$	16.17	24.8	$\bar{3}.08136$	23.27	30.8	$\bar{3}.07268$	33.04
19.0	$\bar{3}.08992$	16.37	25.0	$\bar{3}.08107$	23.55	31.0	$\bar{3}.07239$	33.42
19.2	$\bar{3}.08962$	16.57	25.2	$\bar{3}.08078$	23.83	31.2	$\bar{3}.07211$	33.80
19.4	$\bar{3}.08932$	16.78	25.4	$\bar{3}.08048$	24.11	31.4	$\bar{3}.07182$	34.19
19.6	$\bar{3}.08902$	16.98	25.6	$\bar{3}.08019$	24.40	31.6	$\bar{3}.07154$	34.58
19.8	$\bar{3}.08873$	17.19	25.8	$\bar{3}.07990$	24.69	31.8	$\bar{3}.07125$	34.97
20.0	$\bar{3}.08843$	17.41	26.0	$\bar{3}.07961$	24.99	32.0	$\bar{3}.07097$	35.37
20.2	$\bar{3}.08813$	17.62	26.2	$\bar{3}.07932$	25.28	32.2	$\bar{3}.07068$	35.77
20.4	$\bar{3}.08783$	17.84	26.4	$\bar{3}.07903$	25.58	32.4	$\bar{3}.07039$	36.18
20.6	$\bar{3}.08754$	18.06	26.6	$\bar{3}.07874$	25.89	32.6	$\bar{3}.07011$	36.59
20.8	$\bar{3}.08724$	18.28	26.8	$\bar{3}.07844$	26.19	32.8	$\bar{3}.06983$	37.01
21.0	$\bar{3}.08695$	18.50	27.0	$\bar{3}.07816$	26.50	33.0	$\bar{3}.06954$	37.43
21.2	$\bar{3}.08665$	18.73	27.2	$\bar{3}.07787$	26.82	33.2	$\bar{3}.06926$	37.85
21.4	$\bar{3}.08635$	18.96	27.4	$\bar{3}.07758$	27.13	33.4	$\bar{3}.06897$	38.28
21.6	$\bar{3}.08606$	19.19	27.6	$\bar{3}.07729$	27.45	33.6	$\bar{3}.06869$	38.71
21.8	$\bar{3}.08576$	19.42	27.8	$\bar{3}.07700$	27.78	33.8	$\bar{3}.06841$	39.15
22.0	$\bar{3}.08547$	19.66	28.0	$\bar{3}.07671$	28.10	34.0	$\bar{3}.06812$	39.59
22.2	$\bar{3}.08517$	19.90	28.2	$\bar{3}.07642$	28.43	34.2	$\bar{3}.06784$	40.03
22.4	$\bar{3}.08488$	20.14	28.4	$\bar{3}.07613$	28.77	34.4	$\bar{3}.06756$	40.48
22.6	$\bar{3}.08458$	20.39	28.6	$\bar{3}.07584$	29.10	34.6	$\bar{3}.06727$	40.93
22.8	$\bar{3}.08429$	20.63	28.8	$\bar{3}.07555$	29.44	34.8	$\bar{3}.06699$	41.39
23.0	$\bar{3}.08400$	20.88	29.0	$\bar{3}.07527$	29.78	35.0	$\bar{3}.06671$	41.85
23.2	$\bar{3}.08370$	21.14	29.2	$\bar{3}.07498$	30.13			

XXIII. — CORRECTIONS OF BAROMETER READINGS FOR TEMPERATURE

GLASS SCALE (BUNSEN) M.M. TO BE DEDUCTED

Barometer Reading, mm.	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°
700..	0.120	0.240	0.359	0.479	0.599	0.719	0.838	0.958	1.078	1.198
705..	0.121	0.241	0.362	0.483	0.603	0.724	0.844	0.965	1.086	1.206
710..	0.121	0.243	0.364	0.486	0.607	0.729	0.850	0.972	1.093	1.215
715..	0.122	0.245	0.367	0.489	0.612	0.734	0.856	0.979	1.101	1.223
720..	0.123	0.246	0.370	0.493	0.616	0.739	0.862	0.986	1.109	1.232
725..	0.124	0.248	0.372	0.496	0.620	0.744	0.868	0.992	1.116	1.240
730..	0.125	0.250	0.375	0.500	0.625	0.749	0.874	0.999	1.124	1.249
735..	0.126	0.252	0.377	0.503	0.629	0.755	0.880	1.006	1.132	1.258
740..	0.127	0.253	0.380	0.506	0.633	0.760	0.886	1.013	1.140	1.266
745..	0.127	0.255	0.382	0.510	0.637	0.765	0.892	1.020	1.147	1.275
750..	0.128	0.257	0.385	0.513	0.642	0.770	0.898	1.027	1.155	1.283
755..	0.129	0.258	0.388	0.517	0.646	0.775	0.904	1.033	1.163	1.292
760..	0.130	0.260	0.390	0.520	0.650	0.780	0.910	1.040	1.170	0.300
765..	0.131	0.262	0.393	0.524	0.654	0.785	0.916	1.047	1.178	1.309
770..	0.132	0.264	0.395	0.527	0.659	0.790	0.922	1.054	1.186	1.317
775..	0.133	0.265	0.398	0.530	0.663	0.796	0.928	1.061	1.193	1.326
780..	0.133	0.267	0.400	0.534	0.667	0.801	0.934	1.068	1.201	1.335
785..	0.134	0.269	0.403	0.537	0.672	0.806	0.940	1.075	1.209	1.343
790..	0.135	0.270	0.406	0.541	0.676	0.811	0.946	1.081	1.217	1.352
795..	0.136	0.272	0.407	0.544	0.680	0.816	0.952	1.088	1.224	1.360
800..	0.137	0.274	0.411	0.548	0.684	0.821	0.958	1.095	1.232	1.396

XXIV.—COEFFICIENT OF EXPANSION OF GASES*

Gas.	Constant Volume.			Constant Pressure.		
	Temp. °C.	Pressure, mm.	Coef. of Expansion.	Temp. °C.	Pressure, mm.	Coef. of Expansion.
Air	0–100	5.8	.0037666	0–100	760	.0036706
	0–100	752	.0036660	0–100	1001	.0036728
	0–100	756–833	.0036700	0–100	2620..	.0036964
	0–100	1001	.0036744			.003681
	0–100	2000	.0036903			
	0–100	20000	.0038866			
	0–100	100000	.0041001			
Argon	0–100	517	.003668			
Carbon dioxide	0–100	18.1	.0036753	0–40	518–760	.0037099
	20–98	760	.0037060	0–40	998	.0037536
	0–100	1743–2388	.0037523	0–40	1377	.0037906
	0–100	7927	.0042519	0–100	2520	.0038455
	0–64	19661	.005728	0–64	12988	.005136
	64–100	35–40†	.003956	0–64	18856	.006204
	64–100	94–119†	.007018	64–100	46.5*	.004946
Carbon monoxide	0–100	760	.0036667	0–100	760	.0036688
Helium	0–100	523–681	.0036627			
Hydrogen	16–132	.077	.003328	0–100	760	.0036613
	12–185	4.7	.003656	0–100	200*	.00332
	0–100	520–694	.0036626	0–100	400*	.00295
	0–100	1100	.0036627	0–100	1000*	.00218
Nitrogen	13–132	0.6	.003021	0–100	1002	.0036732
	9–133	5.3	.003290	0–100	200*	.00434
	0–100	760	.0036682	0–100	600*	.00282
	0–40	1002	.0036752	0–100	1000*	.00218
Oxygen	11–132	0.07	.004161	0–100	100*	.00486
	9–132	2.5	.003984	0–100	200*	.00534
		354	.00367	0–100	400*	.00459
	21–98	760	.0036743	0–100	600*	.00357
				0–100	1000*	.00241
Nitric oxide	22–98	760	.0036757	0–100	760	.0037195
			.0037067			
Sulphur dioxide	0–100	760	.0038453	0–100	760	.0039028
	0–100	765–1060	.0038591	0–100	980	.0039804
Water vapor				0–119	760	.004187
				0–200	760	.003938

* The data of this Table are quoted from Sandolt-Börnstein, Phys. Chem. Tabellen, 1905, p. 215.

† Atmospheres.

TABLE XXV.—SOLUBILITY OF GASES IN WATER*

T.	Oxygen, W.		Hydrogen, W.		Nitrogen, B. & B.		Chlorine, W.	
	a.	q.	a.	q.	a.	q.	a.	q.
0	.04890	.006948	.02148	.0001922	.02388	.002977	......	......
1	.04759	.006758	.02126	.0001902	.02337	.002912	......	......
2	.04633	.006576	.02105	.0001882	.02288	.002843	......	......
3	.04512	.006401	.02084	.0001862	.02241	.002790	......	......
4	.04397	.006234	.02064	.0001843	.02196	.002732	......	......
5	.04286	.006074	.02044	.0001824	.02153	.002677	......	......
6	.04181	.005920	.02025	.0001806	.02111	.002624	......	......
7	.04080	.005775	.02007	.0001789	.02070	.002570	......	......
8	.03983	.005633	.01989	.0001772	.02031	.002520	......	......
9	.03891	.005499	.01972	.0001756	.01993	.002472	......	......
10	.03802	.005370	.01955	.0001739	.01956	.002424	3.095	.9969
11	.03718	.005248	.01940	.0001725	.01920	.002378	2.996	.9652
12	.03637	.005129	.01925	.0001710	.01885	.002333	2.900	.9344
13	.03560	.005011	.01911	.0001696	.01851	.002289	2.808	.9048
14	.03486	.004908	.01897	.0001682	.01818	.002246	2.720	.8766
15	.03415	.004804	.01883	.0001669	.01786	.002205	2.635	.8493
16	.03347	.004703	.01869	.0001654	.01755	.002164	2.553	.8230
17	.03283	.004609	.01856	.0001641	.01725	.002125	2.474	.7977
18	.03220	.004515	.01844	.0001630	.01698	.002089	2.399	.7736
19	.03161	.004428	.01831	.0001616	.01667	.002049	2.328	.7508
20	.03102	.004339	.01819	.0001604	.01639	.002012	2.260	.7291
21	.03044	.004253	.01805	.0001590	.01611	.001975	2.200	.7098
22	.02988	.004169	.01792	.0001575	.01584	.001940	2.143	.6916
23	.02934	.004088	.01779	.0001561	.01557	.001903	2.087	.6737
24	.02881	.004009	.01766	.0001548	.01530	.001868	2.035	.6570
25	.02831	.003932	.01754	.0001534	.01504	.001832	1.985	.6411
26	.02783	.003859	.01742	.0001522	.01478	.001798	1.937	.6257
27	.02736	.003787	.01731	.0001509	.01453	.001764	1.891	.6110
28	.02691	.003717	.01720	.0001497	.01428	.001731	1.848	.5973
29	.02649	.003653	.01709	.0001485	.01404	.001699	1.808	.5845
30	.02608	.003588	.01699	.0001470	.01380	.001666	1.769	.5722
35	.02440	.003315	.01666	.0001426	.01271	.001516	1.575	.5103
40	.02306	.003081	.01644	.0001385	.01182	.001386	1.414	.4589
45	.02187	.002860	.01624	.0001338	.01111	.001275	1.300	.4227
50	.02090	.002657	.01608	.0001288	.01061	.001184	1.204	.3927
60	.01946	.002274	.01600	.0001178	.01000	.001026	1.006	.3294
70	.01833	.001857	.01600	.0001021	....	....	0.848	.2792
80	.01761	.001381	.01600	.0000790	....	....	0.672	.2226
90	.01723	.000787	.01600	.0000461	....	....	0.380	.1268
100	.01700	.000000	.01600	.0000000	.01000	.000000	0.000	.0000

* From Technical Chemists' Handbook, Lunge.

Column *a* gives the volume of gas (reduced to 0° and 760 mm.) dissolved by one volume of the liquid at the temperature indicated, if the partial pressure of the gas = 760 mm. Hg.

Column *q* gives the weight of the substance in grams, dissolved by 100 gr. of the pure solvent, if

T.	Carbon Monoxide, W.		Carbon Dioxide, B. & B.		Hydrogen Sulphide, F.		Ammonia, R.	
	a.	q.	a.	q.	a.	q.	a.	q.
0	0.03537	0.004397	1.713	0.3347	4.686	0.710	1298.9	98.7
1	0.03455	0.004293	1.646	0.3214	4.555	0.689	1220.2	92.7
2	0.03375	0.004192	1.584	0.3091	4.428	0.670	1154.7	87.7
3	0.03297	0.004092	1.527	0.2979	4.303	0.651	1100.9	83.6
4	0.03222	0.003997	1.473	0.2872	4.182	0.632	1053.0	79.9
5	0.03149	0.003904	1.424	0.2774	4.063	0.615	1019.5	77.3
6	0.03078	0.003814	1.377	0.2681	3.948	0.596	997.2	75.6
7	0.03009	0.003726	1.331	0.2590	3.836	0.579	974.9	73.9
8	0.02942	0.003641	1.282	0.2494	3.728	0.562	954.5	72.3
9	0.02878	0.003560	1.237	0.2404	3.622	0.546	933.0	70.6
10	0.02816	0.003481	1.194	0.2319	3.520	0.530	910.4	68.9
11	0.02757	0.003416	1.154	0.2240	3.421	0.515	888.0	67.2
12	0.02701	0.003333	1.117	0.2166	3.325	0.500	865.6	65.5
13	0.02646	0.003260	1.083	0.2099	3.232	0.485	843.2	63.7
14	0.02593	0.003188	1.050	0.2033	3.142	0.471	822.1	62.1
15	0.02543	0.003130	1.019	0.1971	3.056	0.458	802.4	60.6
16	0.02494	0.003065	0.985	0.1904	2.973	0.445	783.2	59.1
17	0.02448	0.003007	0.956	0.1845	2.893	0.433	764.1	57.6
18	0.02402	0.002943	0.928	0.1789	2.816	0.421	744.3	56.1
19	0.02360	0.002893	0.902	0.1736	2.742	0.409	725.8	54.7
20	0.02319	0.002839	0.878	0.1689	2.672	0.398	710.6	53.5
21	0.02281	0.002789	0.854	0.1641	....	....	690.2	51.9
22	0.02244	0.002739	0.829	0.1591	....	....	674.3	50.6
23	0.02208	0.002691	0.804	0.1541	....	....	661.0	49.6
24	0.02174	0.002647	0.781	0.1494	....	....	647.8	48.6
25	0.02142	0.002603	0.759	0.1450	....	....	634.6	47.6
26	0.02110	0.002560	0.738	0.1407	....	....	621.3	46.5
27	0.02080	0.002519	0.718	0.1367	....	....	608.1	45.5
28	0.02051	0.002479	0.699	0.1328	....	....	594.8	44.4
29	0.02024	0.002442	0.682	0.1293	....	....	....	......
30	0.01998	0.002405	0.665	0.1259	....	....	....	......
35	0.01877	0.002231	0.592	0.1106	....	....	....	......
40	0.01775	0.002076	0.530	0.0974	....	....	....	......
45	0.01690	0.001934	0.479	0.0862	....	....	....	......
50	0.01615	0.001797	0.436	0.0762	....	....	....	......
60	0.01488	0.001521	0.359	0.0577	....	....	....	......
70	0.01440	0.001276	....	....	....	....	....	......
80	0.01430	0.000981	....	....	....	....	....	......
90	0.01420	0.000568	....	....	....	....	....	......
100	0.01410	0.000000	....	....	....	....	....	......

the partial pressure of the gas + the vapor pressure of the liquid at the temperature indicated = 760 mm. Hg.

The letters following the name of the gas indicate the observer, viz., W. = Winkler; B. & B. = Bohr & Bock; F. = Fauser; R. = Raoult; S. = Schönfeld; R.-D. = Roscoe-Dittmar; B. = Bunsen.

T.	Sulphur dioxide, S.		Hydrogen chloride, R.-D.		Methane, W.	
	a.	q.	a.	q.	a.	q.
0	79.789	22.83	506.7	82.5	0.05563	0.003959
1	77.210	22.09	....	....	0.05401	0.003842
2	74.691	21.37	499.8	81.4	0.05244	0.003729
3	72.230	20.67	....	....	0.05093	0.003620
4	69.828	19.98	493.7	80.4	0.04946	0.003514
5	67.485	19.31	....	....	0.04805	0.003411
6	65.200	18.66	486.9	79.3	0.04669	0.003312
7	62.973	18.02	....	....	0.04539	0.003218
8	60.805	17.40	480.8	78.3	0.04413	0.003127
9	58.697	16.80	....	....	0.04292	0.003039
10	56.647	16.21	473.9	77.2	0.04177	0.002956
11	54.655	15.64	....	....	0.04072	0.002880
12	52.723	15.09	467.7	76.2	0.03970	0.002805
13	50.849	14.56	....	....	0.03872	0.002733
14	49.033	14.04	461.5	75.2	0.03779	0.002666
15	47.276	13.54	....	....	0.03690	0.002600
16	45.578	13.05	455.2	74.2	0.03606	0.002538
17	43.939	12.59	....	....	0.03525	0.002479
18	43.360	12.14	448.3	73.1	0.03446	0.002422
19	40.838	11.70	....	....	0.03376	0.002369
20	39.374	11.29	442.0	72.1	0.03308	0.002319
21	37.970	10.89	....	....	0.03243	0.002270
22	36.617	10.50	435.0	71.0	0.03180	0.002223
23	35.302	10.13	....	....	0.03119	0.002178
24	34.026	9.76	428.7	70.0	0.03061	0.002134
25	32.786	9.41	....	....	0.03006	0.002092
26	31.584	9.07	423.0	69.1	0.02952	0.002051
27	30.422	8.43	....	....	0.02901	0.002012
28	29.314	8.42	417.2	68.2	0.02852	0.001974
29	28.210	8.10	....	....	0.02806	0.001939
30	27.161	7.81	411.5	67.3	0.02762	0.001905
35	22.489	6.47	....	....	0.02546	0.001732
40	18.766	5.41	387.7	63.3	0.02369	0.001586
50	....	....	361.6	59.6	0.02134	0.001359
60	....	....	338.7	56.1	0.01954	0.001145
70	....	....	....	....	0.01825	0.000926
80	....	....	....	....	0.01770	0.000695
90	....	....	....	....	0.01735	0.000398
100	....	....	....	....	0.01700	0.000000

T.	Ethylene, W.		Acetylene, W.		Air, W.		Nitrous Oxide, in Alcohol, B.
	a.	q.	a.	q.	a.	q.	a.
0	0.226	0.0281	1.73	0.20	0.02881	....	4.1780
1	0.219	0.0272	1.68	0.19	0.02808	....	4.1088
2	0.211	0.0262	1.63	0.19	0.02738	....	4.0409
3	0.204	0.0254	1.58	0.18	0.02670	....	3.9741
4	0.197	0.0245	1.53	0.18	0.02606	....	3.9085
5	0.191	0.0237	1.49	0.17	0.02543	....	3.8442
6	0.184	0.0228	1.45	0.17	0.02482	....	3.7811
7	0.178	0.0221	1.41	0.16	0.02424	....	3.7192
8	0.173	0.0214	1.37	0.16	0.02369	....	3.6585
9	0.167	0.0207	1.34	0.15	0.02316	....	3.5990
10	0.162	0.0200	1.31	0.15	0.02264	....	3.5408
11	0.157	0.0194	1.27	0.15	0.02217	....	3.4838
12	0.152	0.0188	1.24	0.14	0.02171	....	3.4279
13	0.148	0.0183	1.21	0.14	0.02127	....	3.3734
14	0.143	0.0176	1.18	0.14	0.02085	....	3.3200
15	0.139	0.0171	1.15	0.13	0.02045	....	3.2678
16	0.136	0.0167	1.13	0.13	0.02005	....	3.2169
17	0.132	0.0162	1.10	0.13	0.01970	....	3.1672
18	0.129	0.0158	1.08	0.12	0.01935	....	3.1187
19	0.125	0.0153	1.05	0.12	0.01901	....	3.0714
20	0.122	0.0150	1.03	0.12	0.01869	....	3.0253
21	0.119	0.0146	1.01	0.12	0.01838	....	2.9805
22	0.116	0.0142	0.99	0.11	0.01808	....	2.9368
23	0.114	0.0139	0.97	0.11	0.01779	....	2.8944
24	0.111	0.0135	0.95	0.11	0.01751	....	2.8532
25	0.108	0.0131	0.93	0.11	0.01724	....	....
26	0.106	0.0129	0.91	0.10	0.01698	....	....
27	0.104	0.0126	0.89	0.10	0.01674	....	....
28	0.102	0.0123	0.87	0.10	0.01650	....	....
29	0.100	0.0121	0.85	0.10	0.01627	....	....
30	0.098	0.0118	0.84	0.09	0.01606	....	....
......	....	....	....	....	0.01503	....	....
......	....	....	....	....	0.01418	....	....
......	....	....	....	....	0.01297	....	....
......	....	....	....	....	0.01216	....	....
......	....	....	....	....	0.01156	....	....
......	....	....	....	....	0.01126	....	....
......	....	....	....	....	0.01113	....	....
......	....	....	....	....	0.01105	....	....

XXVI.—DENSITY OF

WEIGHT IN MILLIGRAMS OF 1 CC. AT 720 TO

mm.	10°	11°	12°	13°	14°	15°	16°	17°
720	1.13380	1.12881	1.12376	1.11875	1.11369	1.10859	1.10346	1.09828
722	1.13699	1.13199	1.12693	1.12191	1.11684	1.11172	1.10658	1.10139
724	1.14018	1.13517	1.13010	1.12506	1.11999	1.11486	1.10971	1.10450
726	1.14337	1.13835	1.13326	1.12822	1.12313	1.11799	1.11283	1.10761
728	1.14656	1.14153	1.13643	1.13138	1.12628	1.12113	1.11596	1.11073
730	1.14975	1.14471	1.13960	1.13454	1.12942	1.12426	1.11908	1.11384
732	1.15294	1.14789	1.14277	1.13769	1.13257	1.12739	1.12220	1.11695
734	1.15613	1.15107	1.14593	1.14085	1.13572	1.13053	1.12533	1.12006
736	1.15932	1.15424	1.14910	1.14401	1.13886	1.13366	1.12845	1.12317
738	1.16251	1.15742	1.15227	1.14716	1.14201	1.13680	1.13158	1.12629
740	1.16570	1.16060	1.15543	1.15032	1.14515	1.13993	1.13470	1.12940
742	1.16889	1.16378	1.15860	1.15348	1.14830	1.14306	1.13782	1.13251
744	1.17208	1.16696	1.16177	1.15663	1.15145	1.14620	1.14095	1.13562
746	1.17527	1.17014	1.16493	1.15979	1.15459	1.14933	1.14407	1.13873
748	1.17846	1.17332	1.16810	1.16295	1.15774	1.15247	1.14720	1.14185
750	1.18165	1.17650	1.17127	1.16611	1.16088	1.15560	1.15032	1.14496
752	1.18484	1.17968	1.17444	1.16926	1.16403	1.15873	1.15344	1.14807
754	1.18803	1.18286	1.17760	1.17242	1.16718	1.16187	1.15657	1.15118
756	1.19122	1.18603	1.18077	1.17558	1.17032	1.16500	1.15969	1.15429
758	1.19441	1.18921	1.18394	1.17873	1.17347	1.16814	1.16282	1.15741
760	1.19760	1.19239	1.18710	1.18189	1.17661	1.17127	1.16594	1.16052
762	1.20079	1.19557	1.19027	1.18505	1.17976	1.17440	1.16906	1.16363
764	1.20398	1.19875	1.19344	1.18820	1.18291	1.17754	1.17219	1.16674
766	1.20717	1.20193	1.19660	1.19136	1.18605	1.18067	1.17531	1.16985
768	1.21036	1.20511	1.19977	1.19452	1.18920	1.18381	1.17844	1.17297
770	1.21355	1.20829	1.20294	1.19768	1.19234	1.18694	1.18156	1.17608

NITROGEN (DIETRICH)

770 mm. Pressure and 10° to 25° Centigrade

mm.	18°	19°	20°	21°	22°	23°	24°	25°
720	1.09304	1.08774	1.08246	1.07708	1.07166	1.06616	1.06061	1.05499
722	1.09614	1.09083	1.08554	1.08015	1.07472	1.06921	1.06365	1.05801
724	1.09924	1.09392	1.08862	1.08322	1.07778	1.07226	1.06669	1.06104
726	1.10234	1.09702	1.09170	1.08629	1.08084	1.07531	1.06973	1.06407
728	1.10544	1.10011	1.09478	1.08936	1.08390	1.07836	1.07277	1.06710
730	1.10854	1.10320	1.09786	1.09243	1.08696	1.08141	1.07581	1.07013
732	1.11165	1.10629	1.10094	1.09550	1.09002	1.08446	1.07885	1.07316
734	1.11475	1.10938	1.10402	1.09857	1.09308	1.08751	1.08189	1.07619
736	1.11785	1.11248	1.10710	1.10165	1.09614	1.09056	1.08493	1.07922
738	1.12095	1.11557	1.11018	1.10472	1.09921	1.09361	1.08796	1.08225
740	1.12405	1.11866	1.11327	1.10799	1.10227	1.09666	1.09100	1.08528
742	1.12715	1.12175	1.11635	1.11086	1.10533	1.09971	1.09404	1.08831
744	1.13025	1.12484	1.11943	1.11393	1.10839	1.10276	1.09708	1.09134
746	1.13335	1.12794	1.12251	1.11700	1.11145	1.10581	1.10012	1.09437
748	1.13645	1.13103	1.12559	1.12007	1.11451	1.10886	1.10316	1.09740
750	1.13955	1.13412	1.12867	1.12314	1.11757	1.11191	1.10620	1.10043
752	1.14266	1.13721	1.13175	1.12621	1.12063	1.11496	1.10924	1.10346
754	1.14576	1.14030	1.13483	1.12928	1.12369	1.11801	1.11228	1.10649
756	1.14886	1.14340	1.13791	1.13236	1.12675	1.12106	1.11532	1.10952
758	1.15196	1.14649	1.13999	1.13543	1.12982	1.12411	1.11835	1.11255
760	1.15506	1.14958	1.14408	1.13850	1.13288	1.12716	1.12139	1.11558
762	1.15816	1.15267	1.14716	1.14157	1.13594	1.13021	1.12443	1.11861
764	1.16126	1.15576	1.15024	1.14464	1.13900	1.13326	1.12747	1.12164
766	1.16436	1.15886	1.15332	1.14771	1.14296	1.13631	1.13051	1.12467
768	1.16746	1.16195	1.15640	1.15078	1.14512	1.13936	1.13355	1.12770
770	1.17056	1.16504	1.15948	1.15385	1.14818	1.14241	1.13659	1.13073

XXVII.—DENSITY OF CARBON

Weight in milligrames of 1 c.c. carbon dioxide at 720 to 770 mm. pressure ings on glass scale. Calculated from 1.976 = weight of 1 liter CO_2 at 0° Cen-

mm.	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°
720	1.7788	1.7706	1.7623	1.7540	1.7457	1.7373	1.7288	1.7203	1.7117	1.7031
722	1.7838	1.7756	1.7673	1.7590	1.7506	1.7422	1.7337	1.7252	1.7166	1.7079
724	1.7888	1.7806	1.7723	1.7639	1.7555	1.7471	1.7386	1.7301	1.7215	1.7128
726	1.7938	1.7856	1.7773	1.7689	1.7605	1.7520	1.7435	1.7349	1.7263	1.7176
728	1.7988	1.7905	1.7822	1.7738	1.7654	1.7569	1.7484	1.7398	1.7312	1.7225
730	1.8038	1.7955	1.7872	1.7788	1.7703	1.7618	1.7533	1.7447	1.7360	1.7273
732	1.8089	1.8005	1.7921	1.7837	1.7752	1.7667	1.7582	1.7496	1.7409	1.7321
734	1.8139	1.8055	1.7971	1.7887	1.7802	1.7717	1.7631	1.7545	1.7458	1.7370
736	1.8189	1.8105	1.8021	1.7936	1.7851	1.7766	1.7680	1.7593	1.7506	1.7418
738	1.8239	1.8155	1.8071	1.7986	1.7901	1.7815	1.7729	1.7642	1.7555	1.7467
740	1.8288	1.8204	1.8120	1.8035	1.7950	1.7864	1.7778	1.7691	1.7603	1.7515
742	1.8338	1.8254	1.8170	1.8085	1.7999	1.7913	1.7827	1.7740	1.7652	1.7564
744	1.8388	1.8304	1.8219	1.8134	1.8048	1.7962	1.7875	1.7788	1.7700	1.7612
746	1.8439	1.8354	1.8269	1.8184	1.8098	1.8011	1.7924	1.7837	1.7749	1.7661
748	1.8489	1.8404	1.8319	1.8233	1.8147	1.8060	1.7973	1.7886	1.7798	1.7709
750	1.8539	1.8454	1.8368	1.8282	1.8196	1.8109	1.8022	1.7934	1.7846	1.7757
752	1.8589	1.8504	1.8418	1.8332	1.8246	1.8159	1.8072	1.7984	1.7895	1.7806
754	1.8639	1.8554	1.8468	1.8382	1.8295	1.8208	1.8120	1.8032	1.7944	1.7854
756	1.8689	1.8603	1.8517	1.8431	1.8344	1.8257	1.8169	1.8081	1.7992	1.7902
758	1.8739	1.8653	1.8567	1.8481	1.8394	1.8306	1.8218	1.8130	1.8041	1.7951
760	1.8789	1.8703	1.8617	1.8530	1.8443	1.8355	1.8267	1.8178	1.8089	1.7999
762	1.8839	1.8753	1.8667	1.8580	1.8492	1.8404	1.8316	1.8227	1.8138	1.8048
764	1.8890	1.8803	1.8716	1.8629	1.8541	1.8453	1.8365	1.8276	1.8187	1.8096
766	1.8940	1.8853	1.8766	1.8679	1.8591	1.8503	1.8414	1.8325	1.8235	1.8144
768	1.8990	1.8903	1.8816	1.8728	1.8640	1.8552	1.8463	1.8374	1.8284	1.8193
770	1.9040	1.8953	1.8865	1.8777	1.8689	1.8601	1.8512	1.8422	1.8332	1.8241

* S. W. Parr, Jour. Am.

DIOXIDE (PARR*)

and 10° to 30° Centigrade. Corrected for aqueous vapor and barometer read-
tigrade, 760 mm. pressure and 41° latitude

20°	21°	22°	23°	24°	25°	26°	27°	28°	29°	30°
1.6944	1.6856	1.6767	1.6678	1.6587	1.6495	1.6403	1.6309	1.6213	1.6116	1.6018
1.6992	1.6904	1.6815	1.6726	1.6635	1.6543	1.6450	1.6356	1.6260	1.6163	1.6065
1.7041	1.6953	1.6863	1.6773	1.6682	1.6590	1.6497	1.6403	1.6307	1.6210	1.6111
1.7089	1.7001	1.6911	1.6821	1.6730	1.6638	1.6544	1.6450	1.6354	1.6256	1.6157
1.7137	1.7049	1.6959	1.6869	1.6778	1.6685	1.6591	1.6497	1.6401	1.6303	1.6204
1.7185	1.7097	1.7007	1.6917	1.6825	1.6732	1.6638	1.6544	1.6448	1.6350	1.6251
1.7233	1.7145	1.7055	1.6964	1.6872	1.6779	1.6685	1.6591	1.6494	1.6396	1.6297
1.7282	1.7193	1.7103	1.7012	1.6920	1.6827	1.6733	1.6638	1.6541	1.6443	1.6343
1.7330	1.7241	1.7151	1.7060	1.6968	1.6875	1.6780	1.6685	1.6588	1.6490	1.6390
1.7378	1.7289	1.7199	1.7107	1.7015	1.6922	1.6827	1.6732	1.6635	1.6537	1.6437
1.7426	1.7337	1.7247	1.7155	1.7063	1.6969	1.6874	1.6778	1.6681	1.6583	1.6483
1.7475	1.7385	1.7295	1.7203	1.7111	1.7017	1.6922	1.6826	1.6729	[illegible]	1.6530
1.7523	1.7433	1.7342	1.7250	1.7158	1.7064	1.6969	1.6873	1.6776	1.6677	1.6577
1.7571	1.7481	1.7390	1.7298	1.7206	1.7112	1.7016	1.6920	1.6822	1.6723	1.6623
1.7619	1.7529	1.7438	1.7346	1.7253	1.7159	1.7063	1.6967	1.6869	1.6770	1.6670
1.7667	1.7577	1.7486	1.7394	1.7301	1.7206	1.7110	1.7014	1.6916	1.6817	1.6716
1.7716	1.7625	1.7534	1.7441	1.7348	1.7254	1.7158	1.7061	1.6963	1.6864	1.6763
1.7764	1.7673	1.7582	1.7489	1.7396	1.7301	1.7205	1.7108	1.7010	1.6910	1.6809
1.7812	1.7721	1.7630	1.7537	1.7443	1.7348	1.7252	1.7155	1.7057	1.6957	1.6856
1.7861	1.7770	1.7678	1.7585	1.7491	1.7396	1.7300	1.7202	1.7104	1.7004	1.6903
1.7909	1.7818	1.7725	1.7632	1.7538	1.7443	1.7347	1.7249	1.7150	1.7050	1.6949
1.7957	1.7866	1.7773	1.7680	1.7586	1.7490	1.7394	1.7296	1.7197	1.7097	1.6996
1.8005	1.7914	1.7821	1.7728	1.7633	1.7538	1.7441	1.7343	1.7244	1.7144	1.7042
1.8053	1.7962	1.7869	1.7776	1.7681	1.7585	1.7488	1.7390	1.7291	1.7191	1.7089
1.8102	1.8010	1.7917	1.7823	1.7728	1.7633	1.7535	1.7437	1.7338	1.7237	1.7135
1.8150	1.8058	1.7965	1.7871	1.7776	1.7680	1.7582	1.7484	1.7385	1.7284	1.7182

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XXVIII

TABLE OF LOGARITHMS

N.	0	1	2	3	4	5	6	7	8	9
100	00 000	043	087	130	173	217	260	303	346	389
101	432	475	518	561	604	647	689	732	775	817
102	860	903	945	988	*030	*072	*115	*157	*199	*242
103	01 284	326	368	410	452	494	536	578	620	662
104	703	745	787	828	870	912	953	995	*036	*078
105	02 119	160	202	243	284	325	366	407	449	490
106	531	572	612	653	694	735	776	816	857	898
107	938	979	*019	*060	*100	*141	*181	*222	*262	*302
108	03 342	383	423	463	503	543	583	623	663	703
109	743	782	822	862	902	941	981	*021	*060	*100
110	04 139	179	218	258	296	336	376	415	454	493
111	532	571	610	650	689	727	766	805	844	883
112	922	961	999	*038	*077	*115	*154	*192	*231	*269
113	05 308	346	385	423	461	500	538	576	614	652
114	690	729	767	805	843	881	918	956	994	*032
115	06 070	108	145	183	221	258	296	333	371	408
116	446	483	521	558	595	633	670	707	744	781
117	819	856	893	930	967	*004	*041	*078	*115	*151
118	07 188	225	262	298	335	372	408	445	482	518
119	555	591	628	664	700	737	773	809	846	882
120	918	954	990	*027	*063	*099	*135	*171	*207	*243
121	08 279	314	350	386	422	458	493	529	565	600
122	636	672	707	743	778	814	849	884	920	955
123	991	*026	*061	*096	*132	*167	*202	*237	*272	*307
124	09 342	377	412	447	482	517	552	587	621	656
125	691	726	760	795	830	864	899	934	968	*003
126	10 037	072	106	140	175	209	243	278	312	346
127	380	415	449	483	517	551	585	619	653	687
128	721	755	789	823	857	890	924	958	992	*025
129	11 059	093	126	160	193	227	261	294	327	361
130	394	428	461	494	528	561	594	628	661	694
131	727	760	793	826	860	893	926	959	992	*024
132	12 057	090	123	156	189	222	254	287	320	352
133	385	418	450	483	516	548	581	613	646	678
134	710	743	775	808	840	872	905	937	969	*001
135	13 033	066	098	130	162	194	226	258	290	322
136	354	386	418	450	481	513	545	577	609	640
137	672	704	735	767	799	830	862	893	925	956
138	988	*019	*051	*082	*114	*145	*176	*208	*239	*270
139	14 301	333	364	395	426	457	489	520	551	582
140	613	644	675	706	737	768	799	829	860	891
141	922	953	983	*014	*045	*076	*106	*137	*168	*198
142	15 229	259	290	320	351	381	412	442	473	503
143	534	564	594	625	655	685	715	746	776	806
144	836	866	897	927	957	987	*017	*047	*077	*107
145	16 137	167	197	227	256	286	316	346	376	406
146	435	465	495	524	554	584	613	643	673	702
147	732	761	791	820	850	879	909	938	967	997
148	17 026	056	085	114	143	173	202	231	260	289
149	319	348	377	406	435	464	493	522	551	580
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P. P.

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P. P.

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150	17 609	638	667	696	725	754	782	811	840	869
151	898	926	955	984	*013	*041	*070	*099	*127	*156
152	18 184	213	241	270	298	327	355	384	412	441
153	469	498	526	554	583	611	639	667	696	724
154	752	780	808	837	865	893	921	949	977	*005
155	19 033	061	089	117	145	173	201	229	257	285
156	312	340	368	396	424	451	479	507	535	562
157	590	618	645	673	700	728	756	783	811	838
158	866	893	921	948	976	*003	*030	*058	*085	*112
159	20 140	167	194	222	249	276	303	330	358	385
160	412	439	466	493	520	548	575	602	629	656
161	683	710	737	763	790	817	844	871	898	925
162	952	978	*005	*032	*059	*085	*112	*139	*165	*192
163	21 219	245	272	299	325	352	378	405	431	458
164	484	511	537	564	590	617	643	669	696	722
165	748	775	801	827	854	880	906	932	958	985
166	22 011	037	063	089	115	141	167	194	220	246
167	272	298	324	350	376	401	427	453	479	505
168	531	557	583	608	634	660	686	712	737	763
169	789	814	840	866	891	917	943	968	994	*019
170	23 045	070	096	121	147	172	198	223	249	274
171	300	325	350	376	401	426	452	477	502	528
172	553	578	603	629	654	679	704	729	754	779
173	805	830	855	880	905	930	955	980	*005	*030
174	24 055	080	105	130	155	180	204	229	254	279
175	304	329	353	378	403	428	452	477	502	527
176	551	576	601	625	650	674	699	724	748	773
177	797	822	846	871	895	920	944	969	993	*018
178	25 042	066	091	115	139	164	188	212	237	261
179	285	310	334	358	382	406	431	455	479	503
180	527	551	575	600	624	648	672	696	720	744
181	768	792	816	840	864	888	912	935	959	983
182	26 007	031	055	079	102	126	150	174	198	221
183	245	269	293	316	340	364	387	411	435	458
184	482	505	529	553	576	600	623	647	670	694
185	717	741	764	788	811	834	858	881	905	928
186	951	975	998	*021	*045	*068	*091	*114	*138	*161
187	27 184	207	231	254	277	300	323	346	370	393
188	416	439	462	485	508	531	554	577	600	623
189	646	669	692	715	738	761	784	807	830	852
190	875	898	921	944	967	989	*012	*035	*058	*081
191	28 103	126	149	171	194	217	240	262	285	307
192	330	353	375	398	421	443	466	488	511	533
193	556	578	601	623	646	668	691	713	735	758
194	780	803	825	847	870	892	914	937	959	981
195	29 003	026	048	070	092	115	137	159	181	203
196	226	248	270	292	314	336	358	380	403	425
197	447	469	491	513	535	557	579	601	623	645
198	667	688	710	732	754	776	798	820	842	863
199	885	907	929	951	973	994	*016	*038	*060	*081
N.	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

P. P.

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P. P.

N.	0	1	2	3	4	5	6	7	8	9
200	30 103	125	146	168	190	211	233	255	276	298
201	320	341	363	384	406	428	449	471	492	514
202	535	557	578	600	621	643	664	685	707	728
203	750	771	792	814	835	856	878	899	920	942
204	963	984	*006	*027	*048	*069	*091	*112	*133	*154
205	31 175	197	218	239	260	281	302	323	345	366
206	387	408	429	450	471	492	513	534	555	576
207	597	618	639	660	681	702	723	744	765	785
208	806	827	848	869	890	911	931	952	973	994
209	32 015	035	056	077	098	118	139	160	181	201
210	222	243	263	284	305	325	346	366	387	408
211	428	449	469	490	510	531	552	572	593	613
212	634	654	675	695	715	736	756	777	797	818
213	838	858	879	899	919	940	960	980	*001	*021
214	33 041	062	082	102	122	143	163	183	203	224
215	244	264	284	304	325	345	365	385	405	425
216	445	465	486	506	526	546	566	586	606	626
217	646	666	686	706	726	746	766	786	806	826
218	846	866	885	905	925	945	965	985	*005	*025
219	34 044	064	084	104	124	143	163	183	203	223
220	242	262	282	301	321	341	361	380	400	420
221	439	459	479	498	518	537	557	577	596	616
222	635	655	674	694	713	733	753	772	792	811
223	830	850	869	889	908	928	947	967	986	*005
224	35 025	044	064	083	102	122	141	160	180	199
225	218	238	257	276	295	315	334	353	372	392
226	411	430	449	468	488	507	526	545	564	583
227	603	622	641	660	679	698	717	736	755	774
228	793	813	832	851	870	889	908	927	946	965
229	984	*003	*021	*040	*059	*078	*097	*116	*135	*154
230	36 173	192	211	229	248	267	286	305	324	342
231	361	380	399	418	436	455	474	493	511	530
232	549	568	586	605	624	642	661	680	698	717
233	736	754	773	791	810	829	847	866	884	903
234	922	940	959	977	996	*014	*033	*051	*070	*088
235	37 107	125	144	162	181	199	218	236	254	273
236	291	310	328	346	365	383	401	420	438	457
237	475	493	511	530	548	566	585	603	621	639
238	658	676	694	712	731	749	767	785	803	822
239	840	858	876	894	912	931	949	967	985	*003
240	38 021	039	057	075	093	112	130	148	166	184
241	202	220	238	256	274	292	310	328	346	364
242	382	399	417	435	453	471	489	507	525	543
243	561	578	596	614	632	650	668	686	703	721
244	739	757	775	792	810	828	846	863	881	899
245	917	934	952	970	987	*005	*023	*041	*058	*076
246	39 094	111	129	146	164	182	199	217	235	252
247	270	287	305	322	340	358	375	393	410	428
248	445	463	480	498	515	533	550	568	585	602
249	620	637	655	672	690	707	724	742	759	777
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P. P.

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P. P.

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250	39 794	811	829	846	863	881	898	915	933	950	
251	967	985	*002	*019	*037	*054	*071	*088	*106	*123	18
252	40 140	157	175	192	209	226	243	261	278	295	1 2
253	312	329	346	364	381	398	415	432	449	466	2 4
254	483	500	518	535	552	569	586	603	620	637	3 5
											4 7
255	654	671	688	705	722	739	756	773	790	807	5 9
256	824	841	858	875	892	909	926	943	960	976	6 11
257	993	*010	*027	*044	*061	*078	*095	*111	*128	*145	7 13
258	41 162	179	196	212	229	246	263	280	296	313	8 14
259	330	347	363	380	397	414	430	447	464	481	9 16
260	497	514	531	547	564	581	597	614	631	647	
261	664	681	697	714	731	747	764	780	797	814	17
262	830	847	863	880	896	913	929	946	963	979	1 2
263	996	*012	*029	*045	*062	*078	*095	*111	*127	*144	2 3
264	42 160	177	193	210	226	243	259	275	292	308	3 5
											4 7
265	325	341	357	374	390	406	423	439	455	472	5 9
266	488	504	521	537	553	570	586	602	619	635	6 10
267	651	667	684	700	716	732	749	765	781	797	7 12
268	813	830	846	862	878	894	911	927	943	959	8 14
269	975	991	*008	*024	*040	*056	*072	*088	*104	*120	9 15
270	43 136	152	169	185	201	217	233	249	265	281	
271	297	313	329	345	361	377	393	409	425	441	16
272	457	473	489	505	521	537	553	569	584	600	1 2
273	616	632	648	664	680	696	712	727	743	759	2 3
274	775	791	807	823	838	854	870	886	902	917	3 5
											4 6
275	933	949	965	981	996	*012	*028	*044	*059	*075	5 8
276	44 091	107	122	138	154	170	185	201	217	232	6 10
277	248	264	279	295	311	326	342	358	373	389	7 11
278	404	420	436	451	467	483	498	514	529	545	8 13
279	560	576	592	607	623	638	654	669	685	700	9 14
280	716	731	747	762	778	793	809	824	840	855	
281	871	886	902	917	932	948	963	979	994	*010	15
282	45 025	040	056	071	086	102	117	133	148	163	1 2
283	179	194	209	225	240	255	271	286	301	317	2 3
284	332	347	362	378	393	408	423	439	454	469	3 5
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285	484	500	515	530	545	561	576	591	606	621	5 8
286	637	652	667	682	697	712	728	743	758	773	6 9
287	788	803	818	834	849	864	879	894	909	924	7 11
288	939	954	969	984	*000	*015	*030	*045	*060	*075	8 12
289	46 090	105	120	135	150	165	180	195	210	225	9 14
290	240	255	270	285	300	315	330	345	359	374	
291	389	404	419	434	449	464	479	494	509	523	14
292	538	553	568	583	598	613	627	642	657	672	1 1
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294	835	850	864	879	894	909	923	938	953	967	3 4
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296	47 129	144	159	173	188	202	217	232	246	261	6 8
297	276	290	305	319	334	349	363	378	392	407	7 10
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300	47 712	727	741	756	770	784	799	813	828	842
301	857	871	885	900	914	929	943	958	972	986
302	48 001	015	029	044	058	073	087	101	116	130
303	144	159	173	187	202	216	230	244	259	273
304	287	302	316	330	344	359	373	387	401	416
305	430	444	458	473	487	501	515	530	544	558
306	572	586	601	615	629	643	657	671	686	700
307	714	728	742	756	770	785	799	813	827	841
308	855	869	883	897	911	926	940	954	968	982
309	996	*010	*024	*038	*052	*066	*080	*094	*108	*122
310	49 136	150	164	178	192	206	220	234	248	262
311	276	290	304	318	332	346	360	374	388	402
312	415	429	443	457	471	485	499	513	527	541
313	554	568	582	596	610	624	638	651	665	679
314	693	707	721	734	748	762	776	790	803	817
315	831	845	859	872	886	900	914	927	941	955
316	969	982	996	*010	*024	*037	*051	*065	*079	*092
317	50 106	120	133	147	161	174	188	202	215	229
318	243	256	270	284	297	311	325	338	352	365
319	379	393	406	420	433	447	461	474	488	501
320	515	529	542	556	569	583	596	610	623	637
321	651	664	678	691	705	718	732	745	759	772
322	786	799	813	826	840	853	866	880	893	907
323	920	934	947	961	974	987	*001	*014	*028	*041
324	51 055	068	081	095	108	121	135	148	162	175
325	188	202	215	228	242	255	268	282	295	308
326	322	335	348	362	375	388	402	415	428	441
327	455	468	481	495	508	521	534	548	561	574
328	587	601	614	627	640	654	667	680	693	706
329	720	733	746	759	772	786	799	812	825	838
330	851	865	878	891	904	917	930	943	957	970
331	983	996	*009	*022	*035	*048	*061	*075	*088	*101
332	52 114	127	140	153	166	179	192	205	218	231
333	244	257	270	284	297	310	323	336	349	362
334	375	388	401	414	427	440	453	466	479	492
335	504	517	530	543	556	569	582	595	608	621
336	634	647	660	673	686	699	711	724	737	750
337	763	776	789	802	815	827	840	853	866	879
338	892	905	917	930	943	956	969	982	994	*007
339	53 020	033	046	058	071	084	097	110	122	135
340	148	161	173	186	199	212	224	237	250	263
341	275	288	301	314	326	339	352	364	377	390
342	403	415	428	441	453	466	479	491	504	517
343	529	542	555	567	580	593	605	618	631	643
344	656	668	681	694	706	719	732	744	757	769
345	782	794	807	820	832	845	857	870	882	895
346	908	920	933	945	958	970	983	995	*008	*020
347	54 033	045	058	070	083	095	108	120	133	145
348	158	170	183	195	208	220	233	245	258	270
349	283	295	307	320	332	345	357	370	382	394
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352	654	667	679	691	704	716	728	741	753	765
353	777	790	802	814	827	839	851	864	876	888
354	900	913	925	937	949	962	974	986	998	*011
355	55 023	035	047	060	072	084	096	108	121	133
356	145	157	169	182	194	206	218	230	242	255
357	267	279	291	303	315	328	340	352	364	376
358	388	400	413	425	437	449	461	473	485	497
359	509	522	534	546	558	570	582	594	606	618
360	630	642	654	666	678	691	703	715	727	739
361	751	763	775	787	799	811	823	835	847	859
362	871	883	895	907	919	931	943	955	967	979
363	991	*003	*015	*027	*038	*050	*062	*074	*086	*098
364	56 110	122	134	146	158	170	182	194	205	217
365	229	241	253	265	277	289	301	312	324	336
366	348	360	372	384	396	407	419	431	443	455
367	467	478	490	502	514	526	538	549	561	573
368	585	597	608	620	632	644	656	667	679	691
369	703	714	726	738	750	761	773	785	797	808
370	820	832	844	855	867	879	891	902	914	926
371	937	949	961	972	984	996	*008	*019	*031	*043
372	57 054	066	078	089	101	113	124	136	148	159
373	171	183	194	206	217	229	241	252	264	276
374	287	299	310	322	334	345	357	368	380	392
375	403	415	426	438	449	461	473	484	496	507
376	519	530	542	553	565	576	588	600	611	623
377	634	646	657	669	680	692	703	715	726	738
378	749	761	772	784	795	807	818	830	841	852
379	864	875	887	898	910	921	933	944	955	967
380	978	990	*001	*013	*024	*035	*047	*058	*070	*081
381	58 092	104	115	127	138	149	161	172	184	195
382	206	218	229	240	252	263	274	286	297	309
383	320	331	343	354	365	377	388	399	410	422
384	433	444	456	467	478	490	501	512	524	535
385	546	557	569	580	591	602	614	625	636	647
386	659	670	681	692	704	715	726	737	749	760
387	771	782	794	805	816	827	838	850	861	872
388	883	894	906	917	928	939	950	961	973	984
389	995	*006	*017	*028	*040	*051	*062	*073	*084	*095
390	59 106	118	129	140	151	162	173	184	195	207
391	218	229	240	251	262	273	284	295	306	318
392	329	340	351	362	373	384	395	406	417	428
393	439	450	461	472	483	494	506	517	528	539
394	550	561	572	583	594	605	616	627	638	649
395	660	671	682	693	704	715	726	737	748	759
396	770	780	791	802	813	824	835	846	857	868
397	879	890	901	912	923	934	945	956	966	977
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403	531	541	552	563	574	584	595	606	617	627		
404	638	649	660	670	681	692	703	713	724	735		
405	746	756	767	778	788	799	810	821	831	842		
406	853	863	874	885	895	906	917	927	938	949		**11**
407	959	970	981	991	*002	*013	*023	*034	*045	*055	**1**	1
408	61 066	077	087	098	109	119	130	140	151	162	**2**	2
409	172	183	194	204	215	225	236	247	257	268	**3**	3
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410	278	289	300	310	321	331	342	352	363	374	**5**	6
411	384	395	405	416	426	437	448	458	469	479	**6**	7
412	490	500	511	521	532	542	553	563	574	584	**7**	8
413	595	606	616	627	637	648	658	669	679	690	**8**	9
414	700	711	721	731	742	752	763	773	784	794	**9**	10
415	805	815	826	836	847	857	868	878	888	899		
416	909	920	930	941	951	962	972	982	993	*003		
417	62 014	024	034	045	055	066	076	086	097	107		
418	118	128	138	149	159	170	180	190	201	211		
419	221	232	242	252	263	273	284	294	304	315		
420	325	335	346	356	366	377	387	397	408	418		
421	428	439	449	459	469	480	490	500	511	521		**10**
422	531	542	552	562	572	583	593	603	613	624	**1**	1
423	634	644	655	665	675	685	696	706	716	726	**2**	2
424	737	747	757	767	778	788	798	808	818	829	**3**	3
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425	839	849	859	870	880	890	900	910	921	931	**5**	5
426	941	951	961	972	982	992	*002	*012	*022	*033	**6**	6
427	63 043	053	063	073	083	094	104	114	124	134	**7**	7
428	144	155	165	175	185	195	205	215	225	236	**8**	8
429	246	256	266	276	286	296	306	317	327	337	**9**	9
430	347	357	367	377	387	397	407	417	428	438		
431	448	458	468	478	488	498	508	518	528	538		
432	548	558	568	579	589	599	609	619	629	639		
433	649	659	669	679	689	699	709	719	729	739		
434	749	759	769	779	789	799	809	819	829	839		
435	849	859	869	879	889	899	909	919	929	939		
436	949	959	969	979	988	998	*008	*018	*028	*038		**9**
437	64 048	058	068	078	088	098	108	118	128	137	**1**	1
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443	640	650	660	670	680	689	699	709	719	729	**8**	7
444	738	748	758	768	777	787	797	807	816	826	**9**	8
445	836	846	856	865	875	885	895	904	914	924		
446	933	943	953	963	972	982	992	*002	*011	*021		
447	65 031	040	050	060	070	079	089	099	108	118		
448	128	137	147	157	167	176	186	196	205	215		
449	225	234	244	254	263	273	283	292	302	312		
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451	418	427	437	447	456	466	475	485	495	504
452	514	523	533	543	552	562	571	581	591	600
453	610	619	629	639	648	658	667	677	686	696
454	706	715	725	734	744	753	763	772	782	792
455	801	811	820	830	839	849	858	868	877	887
456	896	906	916	925	935	944	954	963	973	982
457	992	*001	*011	*020	*030	*039	*049	*058	*068	*077
458	66 087	096	106	115	124	134	143	153	162	172
459	181	191	200	210	219	229	238	247	257	266
460	276	285	295	304	314	323	332	342	351	361
461	370	380	389	398	408	417	427	436	445	455
462	464	474	483	492	502	511	521	530	539	549
463	558	567	577	586	596	605	614	624	633	642
464	652	661	671	680	689	699	708	717	727	736
465	745	755	764	773	783	792	801	811	820	829
466	839	848	857	867	876	885	894	904	913	922
467	932	941	950	960	969	978	987	997	*006	*015
468	67 025	034	043	052	062	071	080	089	099	108
469	117	127	136	145	154	164	173	182	191	201
470	210	219	228	237	247	256	265	274	284	293
471	302	311	321	330	339	348	357	367	376	385
472	394	403	413	422	431	440	449	459	468	477
473	486	495	504	514	523	532	541	550	560	569
474	578	587	596	605	614	624	633	642	651	660
475	669	679	688	697	706	715	724	733	742	752
476	761	770	779	788	797	806	815	825	834	843
477	852	861	870	879	888	897	906	916	925	934
478	943	952	961	970	979	988	997	*006	*015	*024
479	68 034	043	052	061	070	079	088	097	106	115
480	124	133	142	151	160	169	178	187	196	205
481	215	224	233	242	251	260	269	278	287	296
482	305	314	323	332	341	350	359	368	377	386
483	395	404	413	422	431	440	449	458	467	476
484	485	494	502	511	520	529	538	547	556	565
485	574	583	592	601	610	619	628	637	646	655
486	664	673	681	690	699	708	717	726	735	744
487	753	762	771	780	789	797	806	815	824	833
488	842	851	860	869	878	886	895	904	913	922
489	931	940	949	958	966	975	984	993	*002	*011
490	69 020	028	037	046	055	064	073	082	090	099
491	108	117	126	135	144	152	161	170	179	188
492	197	205	214	223	232	241	249	258	267	276
493	285	294	302	311	320	329	338	346	355	364
494	373	381	390	399	408	417	425	434	443	452
495	461	469	478	487	496	504	513	522	531	539
496	548	557	566	574	583	592	601	609	618	627
497	636	644	653	662	671	679	688	697	705	714
498	723	732	740	749	758	767	775	784	793	801
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501	984	992	*001	*010	*018	*027	*036	*044	*053	*062		
502	70 070	079	088	096	105	114	122	131	140	148		
503	157	165	174	183	191	200	209	217	226	234		
504	243	252	260	269	278	286	295	303	312	321		
505	329	338	346	355	364	372	381	389	398	406		
506	415	424	432	441	449	458	467	475	484	492		9
507	501	509	518	526	535	544	552	561	569	578	1	1
508	586	595	603	612	621	629	638	646	655	663	2	2
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510	757	766	774	783	791	800	808	817	825	834	5	5
511	842	851	859	868	876	885	893	902	910	919	6	5
512	927	935	944	952	961	969	978	986	995	*003	7	6
513	71 012	020	029	037	046	054	063	071	079	088	8	7
514	096	105	113	122	130	139	147	155	164	172	9	8
515	181	189	198	206	214	223	231	240	248	257		
516	265	273	282	290	299	307	315	324	332	341		
517	349	357	366	374	383	391	399	408	416	425		
518	433	441	450	458	466	475	483	492	500	508		
519	517	525	533	542	550	559	567	575	584	592		
520	600	609	617	625	634	642	650	659	667	675		
521	684	692	700	709	717	725	734	742	750	759		8
522	767	775	784	792	800	809	817	825	834	842	1	1
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525	72 016	024	032	041	049	057	066	074	082	090	5	4
526	099	107	115	123	132	140	148	156	165	173	6	5
527	181	189	198	206	214	222	230	239	247	255	7	6
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529	346	354	362	370	378	387	395	403	411	419	9	7
530	428	436	444	452	460	469	477	485	493	501		
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532	591	599	607	616	624	632	640	648	656	665		
533	673	681	689	697	705	713	722	730	738	746		
534	754	762	770	779	787	795	803	811	819	827		
535	835	843	852	860	868	876	884	892	900	908		
536	916	925	933	941	949	957	965	973	981	989		7
537	997	*006	*014	*022	*030	*038	*046	*054	*062	*070	1	1
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539	159	167	175	183	191	199	207	215	223	231	3	2
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545	640	648	656	664	672	679	687	695	703	711		
546	719	727	735	743	751	759	767	775	783	791		
547	799	807	815	823	830	838	846	854	862	870		
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552	194	202	210	218	225	233	241	249	257	265		
553	273	280	288	296	304	312	320	327	335	343		
554	351	359	367	374	382	390	398	406	414	421		
555	429	437	445	453	461	468	476	484	492	500		
556	507	515	523	531	539	547	554	562	570	578		
557	586	593	601	609	617	624	632	640	648	656		
558	663	671	679	687	695	702	710	718	726	733		
559	741	749	757	764	772	780	788	796	803	811		
560	819	827	834	842	850	858	865	873	881	889		
561	896	904	912	920	927	935	943	950	958	966		**8**
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570	587	595	603	610	618	626	633	641	648	656		
571	664	671	679	686	694	702	709	717	724	732		
572	740	747	755	762	770	778	785	793	800	808		
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575	967	974	982	989	997	*005	*012	*020	*027	*035		
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577	118	125	133	140	148	155	163	170	178	185		
578	193	200	208	215	223	230	238	245	253	260		
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580	343	350	358	365	373	380	388	395	403	410		
581	418	425	433	440	448	455	462	470	477	485		**7**
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589	77 012	019	026	034	041	048	056	063	070	078	**9**	6
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591	159	166	173	181	188	195	203	210	217	225		
592	232	240	247	254	262	269	276	283	291	298		
593	305	313	320	327	335	342	349	357	364	371		
594	379	386	393	401	408	415	422	430	437	444		
595	452	459	466	474	481	488	495	503	510	517		
596	525	532	539	546	554	561	568	576	583	590		
597	597	605	612	619	627	634	641	648	656	663		
598	670	677	685	692	699	706	714	721	728	735		
599	743	750	757	764	772	779	786	793	801	808		
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602	960	967	974	981	988	996	*003	*010	*017	*025
603	78 032	039	046	053	061	068	075	082	089	097
604	104	111	118	125	132	140	147	154	161	168
605	176	183	190	197	204	211	219	226	233	240
606	247	254	262	269	276	283	290	297	305	312
607	319	326	333	340	347	355	362	369	376	383
608	390	398	405	412	419	426	433	440	447	455
609	462	469	476	483	490	497	504	512	519	526
610	533	540	547	554	561	569	576	583	590	597
611	604	611	618	625	633	640	647	654	661	668
612	675	682	689	696	704	711	718	725	732	739
613	746	753	760	767	774	781	789	796	803	810
614	817	824	831	838	845	852	859	866	873	880
615	888	895	902	909	916	923	930	937	944	951
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617	79 029	036	043	050	057	064	071	078	085	092
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621	309	316	323	330	337	344	351	358	365	372
622	379	386	393	400	407	414	421	428	435	442
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624	518	525	532	539	546	553	560	567	574	581
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627	727	734	741	748	754	761	768	775	782	789
628	796	803	810	817	824	831	837	844	851	858
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636	346	353	359	366	373	380	387	393	400	407
637	414	421	428	434	441	448	455	462	468	475
638	482	489	496	502	509	516	523	530	536	543
639	550	557	564	570	577	584	591	598	604	611
640	618	625	632	638	645	652	659	665	672	679
641	686	693	699	706	713	720	726	733	740	747
642	754	760	767	774	781	787	794	801	808	814
643	821	828	835	841	848	855	862	868	875	882
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647	090	097	104	111	117	124	131	137	144	151
648	158	164	171	178	184	191	198	204	211	218
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P. P.

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655	624	631	637	644	651	657	664	671	677	684
656	690	697	704	710	717	723	730	737	743	750
657	757	763	770	776	783	790	796	803	809	816
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661	82 020	027	033	040	046	053	060	066	073	079
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663	151	158	164	171	178	184	191	197	204	210
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665	282	289	295	302	308	315	321	328	334	341
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667	413	419	426	432	439	445	452	458	465	471
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671	672	679	685	692	698	705	711	718	724	730
672	737	743	750	756	763	769	776	782	789	795
673	802	808	814	821	827	834	840	847	853	860
674	866	872	879	885	892	898	905	911	918	924
675	930	937	943	950	956	963	969	975	982	988
676	995	*001	*008	*014	*020	*027	*033	*040	*046	*052
677	83 059	065	072	078	085	091	097	104	110	117
678	123	129	136	142	149	155	161	168	174	181
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682	378	385	391	398	404	410	417	423	429	436
683	442	448	455	461	467	474	480	481	493	499
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685	569	575	582	588	594	601	607	613	620	626
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687	696	702	708	715	721	727	734	740	746	753
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692	84 011	017	023	029	036	042	048	055	061	067
693	073	080	086	092	098	105	111	117	123	130
694	136	142	148	155	161	167	173	180	186	192
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697	323	330	336	342	348	354	361	367	373	379
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P. P.

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703	696	702	708	714	720	726	733	739	745	751	
704	757	763	770	776	782	788	794	800	807	813	
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715	431	437	443	449	455	461	467	473	479	485	
716	491	497	503	509	516	522	528	534	540	546	
717	552	558	564	570	576	582	588	594	600	606	
718	612	618	625	631	637	643	649	655	661	667	
719	673	679	685	691	697	703	709	715	721	727	
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732	451	457	463	469	475	481	487	493	499	504	
733	510	516	522	528	534	540	546	552	558	564	
734	570	576	581	587	593	599	605	611	617	623	
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736	688	694	700	705	711	717	723	729	735	741	5
737	747	753	759	764	770	776	782	788	794	800	1 | 1
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753	679	685	691	697	703	708	714	720	726	731	
754	737	743	749	754	760	766	772	777	783	789	
755	795	800	806	812	818	823	829	835	841	846	
756	852	858	864	869	875	881	887	892	898	904	
757	910	915	921	927	933	938	944	950	955	961	
758	967	973	978	984	990	996	*001	*007	*013	*018	
759	88 024	030	036	041	047	053	058	064	070	076	
760	081	087	093	098	104	110	116	121	127	133	
761	138	144	150	156	161	167	173	178	184	190	6
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771	705	711	717	722	728	734	739	745	750	756	
772	762	767	773	779	784	790	795	801	807	812	
773	818	824	829	835	840	846	852	857	863	868	
774	874	880	885	891	897	902	908	913	919	925	
775	930	936	941	947	953	958	964	969	975	981	
776	986	992	997	*003	*009	*014	*020	*025	*031	*037	
777	89 042	048	053	059	064	070	076	081	087	092	
778	098	104	109	115	120	126	131	137	143	148	
779	154	159	165	170	176	182	187	193	198	204	
780	209	215	221	226	232	237	243	248	254	260	
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792	873	878	883	889	894	900	905	911	916	922	
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797	146	151	157	162	168	173	179	184	189	195	
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803	472	477	482	488	493	499	504	509	515	520	
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805	580	585	590	596	601	607	612	617	623	628	
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809	795	800	806	811	816	822	827	832	838	843	
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820	381	387	392	397	403	408	413	418	424	429	
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823	540	545	551	556	561	566	572	577	582	587	
824	593	598	603	609	614	619	624	630	635	640	
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826	698	703	709	714	719	724	730	735	740	745	
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842	531	536	542	547	552	557	562	567	572	578	
843	583	588	593	598	603	609	614	619	624	629	
844	634	639	645	650	655	660	665	670	675	681	
845	686	691	696	701	706	711	716	722	727	732	
846	737	742	747	752	758	763	768	773	778	783	
847	788	793	799	804	809	814	819	824	829	834	
848	840	845	850	855	860	865	870	875	881	886	
849	891	896	901	906	911	916	921	927	932	937	
N.	0	1	2	3	4	5	6	7	8	9	P. P.

N.	0	1	2	3	4	5	6	7	8	9
850	92 942	947	952	957	962	967	973	978	983	988
851	993	998	*003	*008	*013	*018	*024	*029	*034	*039
852	93 044	049	054	059	064	069	075	080	085	090
853	095	100	105	110	115	120	125	131	136	141
854	146	151	156	161	166	171	176	181	186	192
855	197	202	207	212	217	222	227	232	237	242
856	247	252	258	263	268	273	278	283	288	293
857	298	303	308	313	318	323	328	334	339	344
858	349	354	359	364	369	374	379	384	389	394
859	399	404	409	414	420	425	430	435	440	445
860	450	455	460	465	470	475	480	485	490	495
861	500	505	510	515	520	526	531	536	541	546
862	551	556	561	566	571	576	581	586	591	596
863	601	606	611	616	621	626	631	636	641	646
864	651	656	661	666	671	676	682	687	692	697
865	702	707	712	717	722	727	732	737	742	747
866	752	757	762	767	772	777	782	787	792	797
867	802	807	812	817	822	827	832	837	842	847
868	852	857	862	867	872	877	882	887	892	897
869	902	907	912	917	922	927	932	937	942	947
870	952	957	962	967	972	977	982	987	992	997
871	94 002	007	012	017	022	027	032	037	042	047
872	052	057	062	067	072	077	082	086	091	096
873	101	106	111	116	121	126	131	136	141	146
874	151	156	161	166	171	176	181	186	191	196
875	201	206	211	216	221	226	231	236	240	245
876	250	255	260	265	270	275	280	285	290	295
877	300	305	310	315	320	325	330	335	340	345
878	349	354	359	364	369	374	379	384	389	394
879	399	404	409	414	419	424	429	433	438	443
880	448	453	458	463	468	473	478	483	488	493
881	498	503	507	512	517	522	527	532	537	542
882	547	552	557	562	567	571	576	581	586	591
883	596	601	606	611	616	621	626	630	635	640
884	645	650	655	660	665	670	675	680	685	689
885	694	699	704	709	714	719	724	729	734	738
886	743	748	753	758	763	768	773	778	783	787
887	792	797	802	807	812	817	822	827	832	836
888	841	846	851	856	861	866	871	876	880	885
889	890	895	900	905	910	915	919	924	929	934
890	939	944	949	954	959	963	968	973	978	983
891	988	993	998	*002	*007	*012	*017	*022	*027	*032
892	95 036	041	046	051	056	061	066	071	075	080
893	085	090	095	100	105	109	114	119	124	129
894	134	139	143	148	153	158	163	168	173	177
895	182	187	192	197	202	207	211	216	221	226
896	231	236	240	245	250	255	260	265	270	274
897	279	284	289	294	299	303	308	313	318	323
898	328	332	337	342	347	352	357	361	366	371
899	376	381	386	390	395	400	405	410	415	419
N.	0	1	2	3	4	5	6	7	8	9

P. P.

	6
1	1
2	1
3	2
4	2
5	3
6	4
7	4
8	5
9	5

	5
1	1
2	1
3	2
4	2
5	3
6	3
7	4
8	4
9	5

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1	0
2	1
3	1
4	2
5	2
6	2
7	3
8	3
9	4

P. P.

N.	0	1	2	3	4	5	6	7	8	9	P. P.
900	95 424	429	434	439	444	448	453	458	463	468	
901	472	477	482	487	492	497	501	506	511	516	
902	521	525	530	535	540	545	550	554	559	564	
903	569	574	578	583	588	593	598	602	607	612	
904	617	622	626	631	636	641	646	650	655	660	
905	665	670	674	679	684	689	694	698	703	708	
906	713	718	722	727	732	737	742	746	751	756	
907	761	766	770	775	780	785	789	794	799	804	
908	809	813	818	823	828	832	837	842	847	852	
909	856	861	866	871	875	880	885	890	895	899	
910	904	909	914	918	923	928	933	938	942	947	
911	952	957	961	966	971	976	980	985	990	995	**5**
912	999	*004	*009	*014	*019	*023	*028	*033	*038	*042	**1** 1
913	96 047	052	057	061	066	071	076	080	085	090	**2** 1
914	095	099	104	109	114	118	123	128	133	137	**3** 2
											4 2
915	142	147	152	156	161	166	171	175	180	185	**5** 3
916	190	194	199	204	209	213	218	223	227	232	**6** 3
917	237	242	246	251	256	261	265	270	275	280	**7** 4
918	284	289	294	298	303	308	313	317	322	327	**8** 4
919	332	336	341	346	350	355	360	365	369	374	**9** 5
920	379	384	388	393	398	402	407	412	417	421	
921	426	431	435	440	445	450	454	459	464	468	
922	473	478	483	487	492	497	501	506	511	515	
923	520	525	530	534	539	544	548	553	558	562	
924	567	572	577	581	586	591	595	600	605	609	
925	614	619	624	628	633	638	642	647	652	656	
926	661	666	670	675	680	685	689	694	699	703	
927	708	713	717	722	727	731	736	741	745	750	
928	755	759	764	769	774	778	783	788	792	797	
929	802	806	811	816	820	825	830	834	839	844	
930	848	853	858	862	867	872	876	881	886	890	
931	895	900	904	909	914	918	923	928	932	937	**4**
932	942	946	951	956	960	965	970	974	979	984	**1** 0
933	988	993	997	*002	*007	*011	*016	*021	*025	*030	**2** 1
934	97 035	039	044	049	053	058	063	067	072	077	**3** 1
											4 2
935	081	086	090	095	100	104	109	114	118	123	**5** 2
936	128	132	137	142	146	151	155	160	165	169	**6** 2
937	174	179	183	188	192	197	202	206	211	216	**7** 3
938	220	225	230	234	239	243	248	253	257	262	**8** 3
939	267	271	276	280	285	290	294	299	304	308	**9** 4
940	313	317	322	327	331	336	340	345	350	354	
941	359	364	368	373	377	382	387	391	396	400	
942	405	410	414	419	424	428	433	437	442	447	
943	451	456	460	465	470	474	479	483	488	493	
944	497	502	506	511	516	520	525	529	534	539	
945	543	548	552	557	562	566	571	575	580	585	
946	589	594	598	603	607	612	617	621	626	630	
947	635	640	644	649	653	658	663	667	672	676	
948	681	685	690	695	699	704	708	713	717	722	
949	727	731	736	740	745	749	754	759	763	768	
N.	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**P. P.**

N.	0	1	2	3	4	5	6	7	8	9	P. P.
950	97 772	777	782	786	791	795	800	804	809	813	
951	818	823	827	832	836	841	845	850	855	859	
952	864	868	873	877	882	886	891	896	900	905	
953	909	914	918	923	928	932	937	941	946	950	
954	955	959	964	968	973	978	982	987	991	996	
955	98 000	005	009	014	019	023	028	032	037	041	
956	046	050	055	059	064	068	073	078	082	087	
957	091	096	100	105	109	114	118	123	127	132	
958	137	141	146	150	155	159	164	168	173	177	
959	182	186	191	195	200	204	209	214	218	223	
960	227	232	236	241	245	250	254	259	263	268	
961	272	277	281	286	290	295	299	304	308	313	**5**
962	318	322	327	331	336	340	345	349	354	358	**1** 1
963	363	367	372	376	381	385	390	394	399	403	**2** 1
964	408	412	417	421	426	430	435	439	444	448	**3** 2
											4 2
965	453	457	462	466	471	475	480	484	489	493	**5** 3
966	498	502	507	511	516	520	525	529	534	538	**6** 3
967	543	547	552	556	561	565	570	574	579	583	**7** 4
968	588	592	597	601	605	610	614	619	623	628	**8** 4
969	632	637	641	646	650	655	659	664	668	673	**9** 5
970	677	682	686	691	695	700	704	709	713	717	
971	722	726	731	735	740	744	749	753	758	762	
972	767	771	776	780	784	789	793	798	802	807	
973	811	816	820	825	829	834	838	843	847	851	
974	856	860	865	869	874	878	883	887	892	896	
975	900	905	909	914	918	923	927	932	936	941	
976	945	949	954	958	963	967	972	976	981	985	
977	989	994	998	*003	*007	*012	*016	*021	*025	*029	
978	99 034	038	043	047	052	056	061	065	069	074	
979	078	083	087	092	096	100	105	109	114	118	
980	123	127	131	136	140	145	149	154	158	162	
981	167	171	176	180	185	189	193	198	202	207	**4**
982	211	216	220	224	229	233	238	242	247	251	**1** 0
983	255	260	264	269	273	277	282	286	291	295	**2** 1
984	300	304	308	313	317	322	326	330	335	339	**3** 1
											4 2
985	344	348	352	357	361	366	370	374	379	383	**5** 2
986	388	392	396	401	405	410	414	419	423	427	**6** 2
987	432	436	441	445	449	454	458	463	467	471	**7** 3
988	476	480	484	489	493	498	502	506	511	515	**8** 3
989	520	524	528	533	537	542	546	550	555	559	**9** 4
990	564	568	572	577	581	585	590	594	599	603	
991	607	612	616	621	625	629	634	638	642	647	
992	651	656	660	664	669	673	677	682	686	691	
993	695	699	704	708	712	717	721	726	730	734	
994	739	743	747	752	756	760	765	769	774	778	
995	782	787	791	795	800	804	808	813	817	822	
996	826	830	835	839	843	848	852	856	861	865	
997	870	874	878	883	887	891	896	900	904	909	
998	913	917	922	926	930	935	939	944	948	952	
999	957	961	965	970	974	978	983	987	991	996	
N.	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**P. P.**

PHYSICAL CONSTANTS OF CHEMICAL COMPOUNDS

XXIX.—PHYSICAL CONSTANTS

MOLECULAR WEIGHT, SPECIFIC GRAVITY, CRYSTALLINE FORM

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water=1. Air=1 (A). H_2=1 (D).	Melting Point, °C.
1	**Acetic Acid**........	$H.C_2H_3O_2$..........	60.03	$1.0607\frac{15°}{4°}$	17°
2	**Aluminium**........	Al................	27.1	2.708–$2.72\frac{16°}{4°}$	657°
3	acetate normal....	$Al(C_2H_3O_2)_3$........	204.17	....	decomp.
4	" basic......	$Al(C_2H_3O_2)_2OH$.....	162.16	....	decomp.
5	bromate.........	$Al(BrO_3)_3.9H_2O$	573.00	....	62.3°
6	bromide..........	Al_2Br_6............	533.72	2.54	93°
7	"	$Al_2Br_6.12H_2O$.......	749.91	....	....
8	carbide..........	Al_4C_3.............	144.40	2.36	....
9	chlorate..........	$Al(ClO_3)_3.6H_2O$....	385.58	....	decomp.
10	chloride..........	Al_2Cl_6............	266.96	....	190, 2½ At.
11	"	$Al_2Cl_6.12H_2O$.......	483.09	....	....
12	fluoride..........	Al_2F_6.............	168.2	3.10	....
13	"	$Al_2F_6.7H_2O$........	294.31	....	$4H_2O$, 120
14	hydroxide mono-..	$Al_2O_3.H_2O$.........	120.22	3.43.......	....
15	" di-.....	$Al_2O_3.2H_2O$........	138.23	....	....
16	" tri-.....	$Al_2O_3.3H_2O$........	156.25	2.423	$2H_2O$, 300
17	iodide............	Al_2I_6.............	815.72	2.63	185°
18	"	$Al_2I_6.12H_2O$........	1031.9	....	....
19	nitride...........	Al_2N_2.............	82.22	....	....
20	nitrate...........	$Al(NO_3)_3.9H_2O$.....	375.27	....	73°
21	oxide............	Al_2O_3.............	102.2	3.73–3.99	2020°
22	phosphate........	$AlPO_4$.............	122.14	2.59	infusible
23	potassium tartrate	$KAl(C_4H_4O_6)_2$......	362.25	....	....
24	sodium chloride...	$Al_2Cl_6.2NaCl$.......	383.88	....	185°
25	" fluoride...	$Al_2F_6.6NaF$........	420.20	2.9–3.08	....

The following abbreviations have been used in this table:—a.=acids; al. =alcohol; alk.=alkalies; aq. r.= aqua regia; dec. or decomp.= decomposes; deliques. = deliquescent; expl. = explodes; gr. = green; hexag. = hexagonal; insol. = insoluble; monocl. = monoclinic; reg. = regular; rhomb. = rhombic; s. = slightly; sol. = soluble; tetrag. = tetragonal; trimet. = trimetric; v. = very; ∞ = soluble in all proportions; $4H_2O$, 120° indicates that 4 molecules of water are given off at 120°. The symbols of the common acids HCl, HNO_3, H_2SO_4 usually designate dilute solutions of these acids. The same rule applies to the symbols of other substances usually employed in solution. Alcohol usually

OF INORGANIC COMPOUNDS

SOLUBILITY,* MELTING AND BOILING POINT, AND COLOR

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	118°	∞	∞	∞ sol. alcohol.........	....
2	> 2200°	insoluble	decomp.	sol. HCl, H_2SO_4, alk.; s. sol. NHO_3	octahedral.....
3	....	soluble	decomp.	....	....
4	....	insoluble	....	sol. a.; insol. NH_4 salts.	amorphous ....
5	decomp. 100	hygroscopic	....	....	crystalline.....
6	263.3°747mm	soluble	....	sol. CS_2, alcohol.......	....
7		soluble	soluble	sol. CS_2, alcohol.......	....
8	....	dec.giv.CH_4	....	soluble acids..........	yellow hexag...
9	....	v. soluble	v. soluble	..................[CS_2	rhombohedral..
10	182.7°752mm	69.87¹⁵°	....	sol. $CHCl_3$, CCl_4, ether,	....
11	....	40	v. soluble	sol. ether; 50, alcohol..	....
12	....	soluble	soluble	....	....
13	$6H_2O$, 250°	insoluble	s. soluble	....	....
14	....	insoluble	insoluble	insol. acids, alkalies....	trimetric......
15	....	insoluble	insoluble	insol. acids, alkalies ...	amorphous.....
16	....	insoluble	insoluble	soluble acids, alkalies .	hexagonal.....
17	360°	....	....	....	....
18	....	v. soluble	v. soluble	soluble alcohol, CS_2....	....
19	....	slowly dec.	....	soluble alkalies........	yellow crystals
20	dec. 134°	v. soluble	....	sol. alk., 100 alcohol ...	rhombic ......
21	....	insoluble	insoluble	sol.conc.H_2SO_4,alk.HCl,	rhombohedral .
22	....	insoluble	insoluble	soluble a., alk.; insoluble $H.C_2H_3O_2$	amorphous....
23	....	soluble	soluble	....	....
24	white heat	soluble	soluble	....	....
25	....	s. soluble	....	insoluble HCl.........	....

designates the ordinary 95% strength. The small figures after specific gravities indicate the temperature at which the specific gravity was taken, the upper figure being the temperature of the substance and the lower figure that of the water. When no temperature is given 15° may be assumed. The color of white or colorless compounds is omitted in the last column.

$>$ = greater than. $<$ = less than.

*Some of the solubilities in this table have been obtained from "Solubilities of Inorganic and Organic Substances" by Seidell, to which the student is referred for more complete data.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Aluminium,** sulphate	$Al_2(SO_4)_3$	342.41	2.71	dec. 770°
2	" "	$Al_2(SO_4)_3.18H_2O$	666.70	1.62	decomp.
3	sulphide	Al_2S_3	150.41	$2.02^{13°}_{4}$	1100°
4	**Alum,** ammonium	$Al_2(SO_4)_3.(NH_4)_2SO_4.24H_2O$	906.95	$1.645^{20°}_{4}$	94.5°
5	ammonium chrom.	$Cr_2(SO_4)_3.(NH_4)_2SO_4.24H_2O$	956.75	1.719	....
6	ammonium iron	$Fe_2(SO_4)_3.(NH_4)_2SO_4.24H_2O$	964.43	1.712	....
7	cæsium	$Al_2(SO_4)_3.Cs_2SO_4.24H_2O$	1136.5	$2.0215^{0°}$	105–106°
8	potassium	$Al_2(SO_4)_3.K_2SO_4.24H_2O$	949.06	$1.7571^{20°}_{4}$	84.5°
9	potassium chrom.	$Cr_2(SO_4)_3.K_2SO_4.24H_2O$	998.86	$1.81278^{0°}$	89°
10	potassium iron	$Fe_2(SO_4)_3.K_2SO_4.24H_2O$	1006.5	1.806	
11	potassium manganese	$Mn_2(SO_4)_3.K_2SO_4.24H_2O$	1004.7	....	....
12	rubidium	$Al_2(SO_4)_3.Rb_2SO_4.24H_2O$	1041.8	1.87	99°
13	sodium	$Al_2(SO_4)_3.Na_2SO_4.24H_2O$	916.86	$1.675^{20°}_{4}$	61°
14	thallium	$Al_2(SO_4)_3.Tl_2SO_4.24H_2O$	1278.8	2.32	....
15	**Ammonia**	NH_3	17.03	0.5971 A. $0.6234^{0°}$ lq	−77.34°
16	**Ammonium** acetate	$NH_4C_2H_3O_2$	77.07	....	89°
17	antimonate	$NH_4SbO_3.2H_2O$	222.27	....	decomp.
18	auricyanide	$Au(CN)_3.NH_4CN.H_2O$	337.30	....	decomp. 200°
19	aurocyanide	$AuCN.NH_4CN$	267.26	....	decomp. 150–200°
20	arsenate	$(NH_4)_3AsO_4.3H_2O$	247.19	....	....
21	arsenite	NH_4AsO_2	125.00	....	....
22	benzoate	$NH_4C_7H_5O_2$	139.082	....	dec. 193.5°
23	borofluoride	NH_4BF_4	105.04	$1.851^{17°}$	....
24	bromide	NH_4Br	97.96	$2.327^{15°}_{4}$	sublimes
25	bromoplatinate	$(NH_4)PtBr_6$...[NH_2	710.43	$4.265^{24°}_{4}$	decomp.
26	carbamate	$NH_4HCO_3.NH_4CO_2$.	157.15	....	sublimes
27	carbonate	$(NH_4)_2CO_3.H_2O$	114.10	....	dec. 85°
28	" acid	NH_4HCO_3	79.05	1.586	dec. 36–60°

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1		$36.1^{20°}$	$89.1^{100°}$		
2		87	$1132^{100°}$	insoluble alcohol	octahedral
3		decomp.		sol. a.	hexagonal needles
4	$23H_2O$, 190°	$3.9^{0°}$	$357^{100°}$	insoluble alcohol	regular
5		$3.9^{5°}$	$15^{15°}$	soluble alcohol	vio. or green regular
6		$40^{15°}$	400	insoluble alcohol	regular
7		$0.3^{0°}$	$42.54^{100°}$		
8	$23H_2O$, 190°	$5.2^{0°}$	$422^{100°}$		regular
9		20	50	insoluble alcohol	green regular
10		$20^{12.5°}$	v. soluble	insoluble alcohol	violet regular
11		decomp.	soluble		violet regular
12		$1.3^{0°}$	$43.25^{80°}$		
13		$103.1^{10°}$	$146.3^{30°}$	insoluble alcohol	regular
14		$4.84^{0°}$	$65.19^{60°}$		
15	−38.5° −38.5°	104960c.c.$^{0°}$ $89.9^{0°}$	72722c.c$^{15°}$ $57.8^{16°}$	$14.8^{20°}$ alcohol, ether	crystals
16		$148^{4°}$			
17		insoluble			crystalline
18		soluble	v. soluble	insoluble alcohol	plates
19		soluble		soluble alkalies	
20		soluble			
21		v. soluble		soluble alkalies	prisms
22		952^{25}	83.3^{100}	$3.57^{25°}$, $13.2^{78°}$ al.	crystals
23		soluble			hexag. prisms
24		$66.2^{10°}$	$128.2^{100°}$	soluble alcohol, ether	regular
25		$0.59^{20°}$			red regular
26		$25^{15°}$	$67^{65°}$		
27		$100^{15°}$		insoluble alcohol	plates
28		$11.9^{0°}$	$27^{30°}$	insoluble alcohol	rhombic or monoclinic

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Ammonium** carbonate, sesqui-	$(NH_4)_2CO_3.2NH_4HCO_3.H_2O$	272.23	....	decomp.
2	citrate	$(NH_4)_3C_6H_5O_7$	243.17	....	....
3	chloraurate	$(NH_4AuCl_4)_4.5H_2O$	447.19	....	$5H_2O$, 100
4	chlorate	NH_4ClO_3	101.50	....	expl. 102°
5	chloride	NH_4Cl	53.50	$1.520^{17°}$	....
6	chloroiridate	$(NH_4)_2IrCl_6$	441.94	2.856	....
7	chloropalladate	$(NH_4)_2PdCl_6$	355.54	2.418	decomp.
8	chloropalladite	$(NH_4)_2PdCl_4$	284.62	....	decomp.
9	chloroplatinate	$(NH_4)_2PtCl_6$	444.04	$3.034^{\frac{24}{4}°}$	decomp.
10	chloroplatinite	$(NH_4)_2PtCl_4$	373.12	....	decomp.
11	chlorostannate	$(NH_4)_2SnCl_6$	367.84	2.511	....
12	chromate	$(NH_4)_2CrO_4$	152.08	$81.886^{11°}$	dec. 185°
13	cyanate	NH_4CNO	60.05	....	decomp.
14	cyanide	NH_4CN	44.05	....	dec. 36°
15	dichromate	$(NH_4)_2Cr_2O_7$	252.08	2.153	decomp.
16	dithionate	$(NH_4)_2S_2O_6$	196.22	21.704	....
17	ferric oxalate	$(NH_4)_3Fe(C_2O_4)_3.4H_2O$	446.03	$1.7785^{17.5°}$	$3H_2O$,100°
18	ferrocyanide	$(NH_4)_4Fe(CN)_6.6H_2O$	261.96	....	....
19	fluoride	NH_4F	37.04		
20	" acid	$NH_4F.HF$	57.05	$1.211^{\frac{12}{12}°}$	....
21	formate	NH_4CHO_2	63.05	1.266	decomp.
22	gallate	$NH_4C_7O_5O_5.H_2O$	205.10	....	....
23	hypophosphite	$NH_4H_2PO_2$	83.10	....	100°
24	iodate	NH_4IO_3	192.96	3.31–3.34	dec. 150°
25	iodide	NH_4I	144.96	2.501	sublimes
26	metavanadanate	NH_4VO_3	69.04	....	decomp.
27	molybdate	$(NH_4)_2MoO_4$	196.08	2.38–2.95	decomp.
28	" hepta-	$(NH_4)_6Mo_7O_{24}.4H_2O$	1236.3	....	....
29	nitrate	NH_4NO_3	80.05	$1.725^{15°}$	153°–166°
30	nitrite	NH_4NO_2	64.05	1.69	decomp.
31	oxalate	$(NH_4)_2C_2O_4.H_2O$	142.10	1.502	....
32	" acid	$NH_4HC_2O_4.H_2O$	125.07	1.556	....
33	perchlorate	NH_4ClO_4	117.50	1.95	decomp.
34	perchromate	$(NH_4)_3CrO_8$	234.13	....	dec. 50°
35	permanganate	NH_4MnO_4	136.97	$2.2076^{10.25°}$	decomp.
36	persulphate	$(NH_4)_2S_2O_8$	228.20	....	decomp.
37	phosphate di-	$(NH_4)_2HPO_4$	132.13	1.619	....
38	" mono-	$NH_4H_2PO_4$	115.10	$1.803^{\frac{19}{4}}$	....

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1		$25^{13°}$	$50^{49°}$		
2		deliques.			
3		soluble		soluble alcohol	yellow monocl.
4		soluble		soluble alcohol	monoclinic
5		$29.4^{0°}$	$77.3^{100°}$	s. sol. al, NH_3, Methyl al.	reg. or tetrag.
6		$0.7^{14°}$	$2.8^{69°}$		reddish-brown
7		soluble			bright red
8		v. soluble		insoluble alcohol	olive gr. needles
9		$0.67^{20°}$	$1.25^{100°}$	0.005 alcohol	yellow regular
10		soluble	v. soluble		tetragonal
11		$33.33^{15°}$			
12		$40^{30°}$	decomp.		yellow monocl.
13		soluble	decomp.	s. soluble alcohol	
14		soluble	v. soluble	soluble alcohol	regular
15		$47.1^{30°}$	v. soluble		orange monocl.
16		v. soluble		insoluble alcohol	monoclinic
17	dec. 165°	$42.8^{0°}$	$345^{100°}$		light green crys.
18		soluble		insoluble alcohol	monoclinic
19		v. soluble	decomp.	s. soluble alcohol	hexagonal
20		v. soluble			rhombic
21		$102^{0°}$	$531^{80°}$		monoclinic
22		soluble			
23		soluble	soluble	v. soluble alcohol	rhombic tablets
24		$2.6^{15°}$	$14.5^{100°}$		rhombic
25		v. soluble	v. soluble	v. soluble alcohol	regular
26		s. soluble	v. soluble	insol. NH_4Cl	crystalline
27		decomposes	decomp.	insoluble alcohol	monoclinic
28		soluble			monoclinic
29	dec. 210°	$118^{0°}$	$871^{100°}$	$3.8^{20°}$ alcohol	rh'b. or tetrag.
30		soluble	decomp.	soluble alcohol	
31		$4.2^{15°}$	41.34		trimet. prisms
32		soluble			trimet. prisms
33		soluble	v. soluble		rhombic
34		s. soluble		s. sol. NH_3; insol. al., ether	red octahedral
35		$8^{15°}$			rhombic
36		$58.2^{0°}$			monoclinic
37		25	decomp.	insoluble alcohol	monoclinic
38		$171^{0°}$	$260^{31°}$		tetragonal

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water=1. Air=1 (A). H_2=1 (D).	Melting Point, °C.
	Ammonium				
1	phosphate meta-	$(NH_4)_4P_4O_{12}$	388.33	....	....
2	phosphite	$NH_4H_2PO_3$	99.10	....	123°
3	phosphomolybdate	$(NH_4)_3PO_4.12MoO_3.3H_2O$	1931.24	....	....
4	salicylate	$NH_4C_7H_5O_3$	155.08	....	....
5	selenate	$(NH_4)_2SeO_4$	179.28	$2.197^{18°}$	decomp.
6	stannic chloride	$(NH_4)_2SnCl_6$	367.84	2.511	....
7	sulphate	$(NH_4)_2SO_4$	132.14	$1.7687^{20°}_{4}$	140°
8	" acid	NH_4HSO_4	115.12	1.787	....
9	sulphite	$(NH_4)_2SO_3.H_2O$	134.17	....	decomp.
10	sulphite acid	NH_4HSO_3	99.12	....	decomp.
11	sulphide	$(NH_4)_2S$	68.15	....	decomp.
12	" penta-	$(NH_4)_2S_5$	196.43	....	....
13	sulphydrate	NH_4HS	51.12	....	decomp.
14	sulphocyanate	NH_4CNS	76.12	$1.3057^{13°}$	159°
15	tartrate	$(NH_4)_2C_4H_4O_6$	184.12	1.601	....
16	" acid	$NH_4HC_4H_4O_6$	167.08	1.680	....
17	thiocarbonate	$(NH_4)_2CS_3$	144.29	....	sublimes
18	thiosulphate	$(NH_4)_2S_2O_3$	148.22	....	....
19	tungstate meta-	$(NH_4)_2W_4O_{13}.8H_2O$	1124.2	....	$7H_2O$,100°
20	" para-	$(NH_4)_6W_7O_{24}.6H_2O$	1888.3	....	$4H_2O$,100°
21	**Antimonic Acid**	$HSbO_3$	169.21	6.6	decomp.
22	" " " pyro-	$H_4Sb_2O_7$	356.43	....	H_2O, 200°
23	**Antimonous Acid**	$HSbO_2$	153.21	....	decomp.
24	**Antimony**	Sb	120.2	6.62	630°
25	bromide	$SbBr_3$	359.98	$4.148^{23°}$	94.2°
26	chloride tri-	$SbCl_3$	226.58	$3.064^{26°}$	73.2°
27	" penta-	$SbCl_5$	297.50	2.346^{20}_{20}	2.8°
28	fluoride tri-	SbF_3	177.2	$4.379^{20.9°}$	292°
29	" penta-	SbF_5	215.2	$2.990^{22.8°}$	....
30	hydride (stibine)	SbH_3	123.22	$4.344^{15°}$A.	−91.5°
31	iodide tri-	SbI_3	500.96	$4.848^{26°}$	170.8°
32	" "	SbI_3	500.96	....	170.8
33	" "	SbI_3	500.96	$4.768^{22°}$	170.8°
34	oxide tri-	Sb_2O_3	288.4	5.2–5.67	red heat
35	" tetr-	Sb_2O_4	304.4	4.07	O, 1060°
36	oxide pent-	Sb_2O_5	320.40	3.78	O, 450°
37	oxychloride (-ous)	$SbOCl$	171.66	....	....
38	" (–ic)	$SbOCl_3$	242.58	....	decomp.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	....	soluble	....	....	tetragonal....
2	dec. 150°	$171^{0°}$	$260^{31°}$.....	....	....
3	....	$.03^{15°}$	insoluble	insol. al., HNO_3; sol. alk.	yellow.......
4	....	$111.1^{25°}$	....	$43.5^{25°}$, $100^{79°}$ al......	monoclinic....
5	....	$117^{7°}$	$197^{100°}$	....	rh'b. or monocl.
6	....	33	....	....	regular.......
7	dec. 280°	$71^{0°}$	$103.3^{100°}$	insoluble alcohol......	rhombic......
8	....	100	....	....	rhombic......
9	....	$100^{12°}$	....	insoluble alcohol.......	monoclinic....
10	....	soluble	....	....	rhombic......
11	....	v. soluble	....	....	.......[prisms
12	....	soluble	....	....	orange red
13	....	v. soluble...	....	soluble alcohol........	rhombic......
14	dec. 170°	$122^{0°}$	$162^{20°}$	soluble alcohol........	....
15	....	soluble	....	....	monoclinic....
16	....	s. soluble	....	insol. al.; sol. a., alk....	....
17	....	v. soluble	....	insol. alcohol, ether....	yellow.......
18	....	soluble	....	....	rhombic......
19	....	120	....	insol. alcohol, ether....	octahedra....
20	....	$2.8^{15°}$	$4.5^{22°}$	....	rhombic......
21	....	s. soluble	s. soluble	soluble acids and KOH	....
22	....	s. soluble	s. soluble	soluble KOH.........	....
23	....	insoluble	insoluble	insoluble alcohol......	....
24	1440°	insoluble	insoluble	sol. hot conc. H_2SO_4, aq.r.	hexag. rhomb.
25	280°	decomp.	decomp.	sol. HCl, HBr, CS_2, al.	rhombic......
26	223.5°	$601.6^{0°}$	$4531^{60°}$	sol. al., HCl, $H_2C_4H_4O_6$	rhombic......
27	102°–103° *	decomp.	decomp.	sol. HCl..............	....
28	sublimes	soluble	decomp.	....	octahedral....
29	155°	soluble	....	soluble KF...........	oily liquid....
30	−18° †	20c.c.	4	1500c.c.al., 2500c.c. CS_2..	....
31	401°	decomp.	decomp.	soluble alcohol,......	red hexagonal
32	401°	decomp.	decomp.	HI, HCl...........	yellow rhomb.
33	401°	decomp.	decomp.	KI, CS_2...........	red monoclinic
34	1550°	$.00182^{15°}$	.01	sol. HCl, KOH, $H_2C_4H_4O_6$	trimetric octahedral
35	....	insoluble	insoluble	sol. hot conc. HCl.....	....
36	O_2, 1060°	insoluble	insoluble	soluble HCl, KOH, HI.	yellow.......
37	....	insoluble	decomp.	insol. al.; sol. HCl, CS_2.	monoclinic....
38	....	insoluble	decomp.	soluble alcohol........	yellow.......

* At 68 mm. † Decomposes at 150°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Antimony sulphate..	$Sb_2(SO_4)_3$.........	528.41	4.89	decomp.
2	sulphide tri-......	Sb_2S_3..........	336.61	4.652	fusible
3	" penta-....	Sb_2S_5...........	400.75	4.120$^{0°}$	fusible
	Antimonyl				
4	potassium tartrate.	$K(SbO)C_4H_4O_6.\frac{1}{2}H_2O$	332.33	2.6	$\frac{1}{2}H_2O$,100°
5	sulphate basic.....	$(SbO)_2SO_4.Sb_2(OH)_4$	676.50	....	....
6	Argon............	A..............	39.88	1.379 A. 19.96 D.	−187.9°
7	Arsenic crystalline...	As_4..............	299.84	5.727$^{14°}$	850°
8	" amorphous...	As_4..............	299.84	4.716$^{14°}$	....
9	acid............	$H_3AsO_4.\frac{1}{2}H_2O$.....	150.99	2.5	35.5°
10	fluoride..........	AsF_5............	169.96	5.964 D.	−80°
11	iodide di-........	AsI_2............	328.80	....	decomp. 135.5°
12	pentoxide........	As_2O_5...........	229.92	3.99–4.25	red heat
13	sulphide di-(realgar)	As_2S_2...........	214.06	3.4–3.6	307°
14	" penta-.....	As_2S_5...........	310.27	....	v. fusible
15	Arsenous bromide...	$AsBr_3$...........	314.72	3.66$\frac{15}{15}$	31°
16	chloride..........	$AsCl_3$...........	181.34	2.205$\frac{0}{4}$	−18°
17	fluoride..........	AsF_3............	131.96	2.73	−8.5°
18	hydride (arsine)	AsH_3............	77.98	2.695 A.	−113.5°
19	iodide...........	AsI_3............	455.72	4.39$\frac{13}{13}$	140.7°
20	oxide...........	As_4O_6...........	395.84	3.65–4.15	sublimes
21	"	As_4O_6...........	395.84	3.738	200°
22	oxychloride.......	AsOCl...........	126.42	....	fusible
23	phosphide........	AsP............	105.96	....	....
24	selenide..........	As_2Se_3...........	386.52	4.75	360°
25	sulphide (orpiment)	As_2S_3...........	246.13	3.40–3.46	310°
26	Auric bromide.......	$AuBr_3$...........	436.96	....	....
27	chloride..........	$AuCl_3$...........	303.58	....	288°*
28	"	$AuCl_3.2H_2O$.......	339.61	....	decomp.
29	cyanide..........	$Au(CN)_3.6H_2O$....	383.33	....	....
30	hydroxide........	$Au(OH)_3$.........	248.22	....	$1\frac{1}{2}H_2O$,100
31	iodide...........	AuI_3............	577.96	....	....
32	hydrogen nitrate...	$Au(NO_3)_3.HNO_3.3H_2O$.	500.30	2.58	decomp.
33	oxide...........	Au_2O_3...........	442.4	....	0.160°†
34	sulphate.........	$Au_2O_3.2SO_3.H_2O$....	620.54	....	....
35	sulphide.........	Au_2S_3...........	490.61	....	....
36	Auricyanhydric Acid	$HAu(CN)_4.3H_2O$....	356.30	....	50°
37	Aurichlorohydric Acid	$HAuCl_4.4H_2O$......	412.11	....	....

* Under a pressure of two atmospheres of Chlorine. † Loses O_3 at 250°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	decomp.	decomp.	sol. H_2SO_4...........	....
2	volatile	.000175	decomp.	sol.alk.,NH_4HS,K_2S,HCl	black hexag...
3	....	insoluble	insoluble	sol. alk., NH_4HS, HCl..	orange........
4	....	$5.26^{8.7°}$	$35.7^{100°}$	insol. al., sol. glyc......	octahedral.....
5	....	insoluble	decomp.	$5.5^{15°}$ glycerene.......	....
6	−186.1°	$5.6c.c.^{1°}$	$3.43c.c.^{50°}$	....	....
7	Subl. 554°	insoluble	insoluble	sol. HNO_3, $Cl_2.H_2O$...	gray rhomboh.
8	<360°	insoluble	insoluble	aq. r., hot alk........	black amor-
9	H_2O, 160°	16.7	50	soluble alkalies........	........[phous
10	−53°	soluble	....	soluble alk., al., ether..	....
11	....	....	....	....	....
12	decomp.	150	v. soluble	v. soluble.............	amorphous.....
13	565°	insoluble	insoluble	sol. K_2S, $NaHCO_3$.....	red monoclinic
14	sublimes	insoluble	insoluble	soluble alkalies, HNO_3.	yellow........
15	221°	decomp.	decomp.	soluble HBr, HCl......	prisms........
16	130.2°	decomp.	decomp.	sol. HBr, HCl, al., ether	needles ....
17	63°	decomp.	decomp.	sol. alcohol, ether......	....
18	−54.8° ‡	....	....	s. soluble alkalies......	....
19	394°–414°	....	$30^{100°}$	soluble alcohol, ether ..	red hexagonal.
20	125°–150°	$1.7^{16°}$	10.14	sol. alk.; alk. carbon-	reg. octahedral
21	....	3.7	11.46	ates; HCl, alcohol	amorphous....
22	....	decomp.	decomp.	....	....
23	....	decomp.	decomp.	sol. CS; insol. al., ether	brown.........
24	....	insoluble	decomp.	soluble alkalies........	....[monoclinic
25	>700°	0.00005	s. soluble	sol. alk.; alk. carbonates	yellow or red
26	....	soluble	....	soluble ether..........	dark brown....
27	....	68	v. soluble	soluble alcohol, ether ..	red brown leaf
28	....	soluble	soluble	soluble alcohol........	orange........
29	....	v. soluble	v. soluble	soluble alcohol........	....
30	dec. 250°	insoluble	insoluble	soluble conc. HNO_3....	yellow brown..
31	....	insoluble	decomp.	soluble iodides........	dark green.....
32	....	decomp.	....	soluble HNO_3.........	yellow triclinic octahedral
33	....	insoluble	insoluble	soluble HCl...........	black.........
34	....	deliques.	decomp.	sol. HCl., 17 Conc.H_2SO_4	....
35	....	insoluble	....	sol. Na_2S, K_2S; insol. a..	brown.........
36	decomp.	soluble	....	soluble alcohol, ether ..	tablets........
37	....	v. soluble	v. soluble	....	crystalline ....

‡ Decomposes at 230°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water= 1. Air= 1 (A). H_2= 1 (D).	Melting Point, °C.
1	Auroauric bromide...	$AuBr_2$	357.04	....	dec. 115°
2	chloride	$AuCl_2$	268.12	....	dec. 250°
3	oxide	Au_2O	410.4	....	dec. 250°
4	sulphide	AuS	229.27	....	dec. 140°
5	Aurobromhydric Acid	$HAuBr_4.5H_2O$	607.96	....	27°
6	Aurous bromide	AuBr	277.14	....	dec. 115°
7	chloride	AuCl	232.66	....	....
8	cyanide	AuCN	223.21	....	decomp.
9	iodide	AuI	324.12	....	dec. 120°
10	oxide	Au_2O	410.40	....	dec. 250°
11	sulphide *	Au_2S	426.47	....	....
12	Barium	Ba	137.37	3.78	850°
13	acetate	$Ba(C_2H_3O_2)_2.H_2O$	273.43	2.02	decomp.
14	arsenate	$Ba_3(AsO_4)_2$	690.07	....	....
15	"	$BaHAsO_4.H_2O$	295.35	....	H_2O, 150°
16	boride	BaB_6	203.37	$4.36^{15°}$	....
17	bromate	$Ba(BrO_3)_2.H_2O$	411.23	3.820	decomp.
18	bromide	$BaBr_2$	297.21	4.781^{24}_{4}	880°
19	"	$BaBr_2.2H_2O$	333.24	3.852^{24}_{4}	$2H_2O$,100°
20	carbide	BaC_2	161.37	3.75	....
21	carbonate	$BaCO_3$	197.37	4.275	1380°
22	chlorate	$Ba(ClO_3)_2.H_2O$	322.31	3.179	414° †
23	chloride	$BaCl_2$	208.29	3.856^{24}_{4}	960°
24	"	$BaCl_2.2H_2O$	244.32	3.097^{24}_{4}	860° ‡
25	chloroplatinate	$BaPtCl_6.4H_2O$	617.39	2.86	....
26	chloroplatinite	$BaPtCl_4.3H_2O$	528.46	2.868	....
27	chromate	$BaCrO_4$	253.47	$4.498^{15°}$	....
28	cyanide	$Ba(CN)_2$	189.39	....	....
29	dichromate	$BaCr_2O_7$	353.37	....	....
30	"	$BaCr_2O_7.2H_2O$	389.40	....	....
31	dithionate	$BaS_2O_6.2H_2O$	333.54	5.6	....
32	ferrocyanide	$Ba_2Fe(CN)_6.6H_2O$	594.74	....	....
33	fluoride	BaF_2	175.37	4.828	1280°
34	fluosilicate	$BaSiF_6$	279.67	$4.28^{15°}$	....
35	fluobromide	$BaBr_2.BaF_2$	472.58	4.96	....
36	fluochloride	$BaCl_2.BaF_2$	383.66	$4.51^{18°}$	....
37	fluoiodide	$BaI_2.BaF_2$	566.68	5.21	....
38	formate	$Ba(CHO_2)_2$	227.39	3.212	....

* For other compounds see "Gold." † Anhydrous.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	...	decomp.	...	...	black
2	...	decomp.	...	...	dark red
3	...	insoluble	insoluble	soluble cold HCl	olive brown
4	...	insoluble	insoluble	insol. acids; sol. $(NH_4)_2S$	black
5	...	v. soluble	...	...	red crystals
6	...	insoluble	...	decomp. by acid	grayish yellow
7	...	insoluble	decomp.	...	yellowish white
8	...	insoluble	insoluble	insol. acids; sol. KCN	yellow crystals
9	...	insoluble	s. soluble	sol. excess KI	yellow
10	...	s. soluble	insoluble	sol. HI, alkalies	violet
11	...	insoluble	...	insoluble acids	black
12	vol. 950°	decomp.	decomp.	sol. al., a.; insol. b'z'l, petroleum	silvery crystals
13	...	$62.9^{.3°}$	$80.5^{99°}$	insoluble alcohol	prisms
14	...	0.055	...	soluble acids, NH_4Cl	...
15	$1\frac{1}{2}H_2O$, 225°	...	...	...	pearly crystals
16	...	insoluble	insoluble	soluble HNO_3	black regular
17	...	$0.3^{0°}$	$5.67^{100°}$	...	monoclinic
18	...	$98^{0°}$	$149^{100°}$	...	...
19	...	$125^{0°}$	$181.7^{100°}$	v. soluble methyl al.	monoclinic
20	...	dec. to C_2H_2	...	decomp. by acids	gray crystals
21	dec. 1450°	$0.0022^{20°}$	$0.0065^{100°}$	sol. a., NH_4Cl	rhombic
22	...	$19.2^{3°}$	$111.2^{100°}$	...	monoclinic
23	...	$30.9^{0°}$	$62.7^{100°}$	insol. al.; s. sol. HCl,	
24	...	$36.2^{0°}$	$73.5^{100°}$	HNO_3	...
25	...	soluble	...	decomp. by acids	red monoclinic.
26	...	soluble	...	v. soluble 93% al.	... [plates
27	...	$0.00038^{18°}$	0.0043	soluble HCl, HNO_3	yellow rhombic
28	...	$80^{14°}$	...	$18^{14°}$ alcohol	...
29	...	s. soluble	...	sol. hot conc. H_2SO_4	red monocl. pr.
30	...	decomp.	...	...	yellow needles
31	...	$24.75^{18°}$	$90.9^{100°}$	...	rhombic
32	...	$0.1^{15°}$	$1^{75°}$	...	yellow monocl.
33	...	$0.163^{18°}$	s. soluble	soluble acids, NH_4Cl	reg. octahedral
34	...	$0.026^{17°}$	$0.09^{100°}$	insol. al.; s. sol. HCl, NH_4Cl. [HNO_3	...
35	...	decomp.	decomp.	insol. al.; sol. conc. HCl,	plates
36	...	decomp.	decomp.	insol. al.; sol. conc. HCl, HNO_3 [HNO_3	plates
37	...	decomp.	decomp.	insol. al.; sol. conc. HCl,	plates
38	...	$27.76^{0°}$	$39.71^{80°}$	insoluble alcohol, ether.	monoclinic

‡ Loses $2H_2O$ at 100°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Barium hexanitride	$BaN_6.H_2O$	239.45	....	explodes
2	hydride	BaH_2	139.39	$4.21^{0°}$	volatile
3	hydroxide	$Ba(OH)_2.8H_2O$	315.51	1.656	78° *
4	hypophosphate	$Ba_2P_2O_6$	432.82	....	....
5	hypophosphite	$Ba(H_2PO_2)_2.H_2O$	285.50	2.875	....
6	iodate	$Ba(IO_3)_2.H_2O$	505.23	5.23	H_2O, 130°
7	iodide	BaI_2	391.21	$5.150^{25°}$	539°–740°
8	manganate	$BaMnO_4$	256.3	4.85	....
9	metatungstate	$BaW_4O_{13}.9H_2O$	1243.5	4.298	....
10	nitrate	$Ba(NO_3)_2$	261.39	$3.244^{23°}$	575°
11	nitrite	$Ba(NO_2)_2.H_2O$	247.41	$3.173^{29°}$	dec. 115°
12	oxalate	$BaC_2O_4.H_2O$	243.39	2.6578	....
13	oxide	BaO	153.37	4.73–5.46	BaO_2.450°
14	"	BaO	153.37	5.32–5.74	....
15	perchlorate	$Ba(ClO_4)_2.4H_2O$	408.35	....	†
16	periodate	$Ba_5(IO_6)_2$	1132.6	....	....
17	permanganate	$Ba(MnO_4)_2$	375.3	....	....
18	peroxide	BaO_2	169.37	4.96	O, 450°
19	"	$BaO_2.8H_2O$	313.47	....	....
20	persulphate	$Ba(SO_4)_2.4H_2O$	401.57	....	....
21	phosphate tri-	$Ba_3(PO_4)_2$	602.19	....	....
22	" mono-	$BaH_4(PO_4)_2$	331.48	2.9	....
23	" di-	$BaHPO_4$	233.42	$4.165^{15°}$	....
24	" pyro-	$Ba_2P_2O_7$	448.80	$4.1^{16°}$	....
25	platinocyanide	$BaPt(CN)_4.4H_2O$	508.67	3.054	....
26	selenate	$BaSeO_4$	280.57	4.75	....
27	silicate	$BaSiO_3$	213.67	$4.44^{18°}$	1470°
28	"	$BaSiO_3.6H_2O$	321.87	....	....
29	sulphate	$BaSO_4$	233.44	{4.476 4.330	} 1580° decomp.
30	sulphate acid	$Ba(HSO_4)_2$	331.53	....	....
31	sulphydrate	$Ba(SH)_2.4H_2O$	275.59	....	....
32	sulphide mono-	BaS	169.44	$4.25^{15°}$	infusible
33	" tri-	BaS_3	201.52	....	....
34	" tetra-	$BaS_4.H_2O$	283.67	2.98	dec. 300°
35	sulphite	$BaSO_3$	217.44	....	....
36	sulphocyanate	$Ba(CNS)_2.2H_2O$	289.57	....	....
37	tartrate	$BaC_4H_4O_6.H_2O$	303.42	$2.980^{20.8°}$	....
38	thiosulphate	$BaS_2O_3.H_2O$	267.53	3.447	....
39	**Beryllium** (See Glucinum)				
40	**Bismuth**	Bi	208.0	9.7474	270°

* Loses $7H_2O$ at 95°; $8H_2O$ at 780°.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1		v. soluble	v. soluble		crystalline
2	1400°	decomp.	decomp.		crystalline
3	103°	$5.56^{15°}$	$182.7^{80°}$	soluble al.; insol. ether	tetragonal
4		s. soluble		soluble alcohol	needles
5		29	33	insoluble alcohol	monoclinic
6		$0.008^{0°}$	$0.21^{100°}$	insol. al.; sol. HCl, HNO_3	monoclinic
7		$170^{0°}$	$272^{100°}$	v. soluble alcohol	rhombic
8		insoluble		decomp. by acids	green hexag.
9		decomp.	v. soluble		tetragonal
10	decomp.	$5.2^{0°}$	$32.2^{100°}$	insol. al.; s. sol. acids	regular
11		$58^{0°}$	$97^{35°}$	1.6, 94% alcohol	hexag. needles
12		$0.0093^{18°}$	$0.0228^{100°}$	sol.acids NH_4Cl; insol.al.	
13		$1.5^{0°}$	$90.8^{80°}$	soluble HCl, HNO_3	amorphous
14					regular
15		v. soluble		v. soluble alcohol	hexagonal
16		insoluble		soluble HNO_3	
17		$62.5^{11°}$	$72.4^{25°}$		
18		insoluble	decomp.	soluble dilute acids	
19		insoluble	decomp.	soluble dilute acids	
20		$52.2^{0°}$		soluble alcohol	prisms
21		insoluble		soluble	
22		soluble		soluble acids	triclinic
23		0.01–.02		soluble acids, NH_4 salts	rhombic needles
24		0.01		soluble acids, NH_4 salts	amorphous
25		$3^{16°}$			gray to yel. mon.
26		0.0118	0.0138	insoluble HNO_3; sol.HCl	
27		soluble	decomp.	soluble HCl	rhombic
28					
29	‡	$0.000172^{0°}$	$0.0003^{34°}$	0.006, 3% HCl; sol. conc. H_2SO_4	rhombic amorphous
30					
31		soluble		insoluble alcohol	rhombic
32		decomp.		insoluble alcohol	white amorph.
33		soluble			yellow green
34		$41^{15°}$	v. soluble	insoluble alcohol, CS_2	red rhombic
35		$0.0197^{20°}$	$0.00177^{80°}$	v. soluble HCl	hexagonal
36		soluble		$35^{20°}$, $38^{79°}$ alcohol	needles
37		$0.026^{18°}$	$0.058^{90°}$	$0.032^{18°}$ alcohol	
38		$0.2675^{17.5°}$		insoluble alcohol	
39					
40	1420°	insoluble	insoluble	sol. HNO_3, aq. r., conc. H_2SO_4	reddish rhombohedral

† The anhydrous salt melts at 505°. ‡ Volatilizes slowly at 1300°

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water= 1. Air= 1 (A). H_2= 1 (D).	Melting Point, °C.
1	**Bismuth** bromide	$BiBr_3$	447.76	5.60	219°
2	carbonate sub-	$Bi_2O_3.CO_2.H_2O$	526.02	6.86	decomp.
3	chloride di-	$BiCl_2$	278.9	4.86	163°
4	" tri-	$BiCl_3$	314.38	4.56$^{11°}$	227°
5	citrate	$BiC_6H_5O_7$	397.040		decomp.
6	dichromate basic	$(BiO)_2Cr_2O_7$	764.0		
7	hydroxide	$Bi(OH)_3$	259.02		H_2O,100°
8	iodide	BiI_3	588.76	5.65$^{20°}$	>439°
9	nitrate	$Bi(NO_3)_3.5H_2O$	484.11	2.78	74°
10	" sub-	$BiONO_3.H_2O$	304.03	4.928$^{15°}$	dec. 260°
11	oxalate	$Bi_2(C_2O_4)_3$	680.0		
12	oxide tri-	Bi_2O_3	464.00	8.8–9.0	820°–860°
13	" tetra-	$Bi_2O_4.2H_2O$	516.03	5.6	O, 305°
14	" penta-	Bi_2O_5	496.00		O, 150°
15	" "	$Bi_2O_5.H_2O$	514.02	5.917	H_2O, 120°
16	oxybromide	$BiOBr$	303.92	8.082$^{15°}$	
17	oxychloride	$BiOCl$	259.46	7.717$^{15°}$	red heat
18	oxyfluoride	$BiOF$	243.0	7.55$^{20°}$	
19	oxyiodide	$BiOI$	350.92	7.922$^{15°}$	
20	phosphate	$BiPO_4$	303.04		
21	selenide	Bi_2Se_3	653.6	6.82	decomp.
22	sulphate	$Bi_2(SO_4)_3$	704.21		
23	sulphide	Bi_2S_3	512.21	7.00–7.81	decomp.
24	**Boric Acid**	H_3BO_3	62.02	1.4347$^{15°}$	184°–186°
25	**Boron**	B	11.0	2.45 / 2.554$^{18}_{4}$°	2200°–2500°
26	bromide	BBr_3	250.76	2.650$^{0}_{4}$	
27	carbide	B_6C	78.0	2.51	
28	chloride	BCl_3	117.38	1.434$^{0}_{4}$	
29	fluoride	BF_3	68.00	2.3 A.	−127°
30	hydride	BH_3	14.02		
31	iodide	BI_3	391.76	3.3$^{50°}$	43°
32	oxide	B_2O_3	70.00	1.75–1.83	577°
33	phosphide	BP	42.04		burns 200
34	sulphide tri-	B_2S_3	118.21	1.55	310°
35	" penta-	B_2S_5	182.35	1.85	390°
36	**Borofluohydric Acid**	HBF_4	88.01		
37	**Bromic Acid**	$HBrO_3$	128.97		dec. 100°
38	**Bromine**	Br_2	159.84	3.1883$^{0°}$	−7.3°
39	chloride	$BrCl.10H_2O$	295.58		7°
40	fluoride	BrF_3	136.92		5°

* Loses 1½ H_2O at 150°.   † Loses 1½ H_2O at 300°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	453°–498°	decomp.	....	soluble ether, HBr.....	yellow cryst..
2	....	insoluble	....	sol. a.; insol. Na_2CO_3..	....
3	dec. 300°	decomp.....	....	....	black needles .
4	435°–447°	decomp.	....	sol. al., a., acetone	....
5	....	insoluble....	....	insol. al., sol. NH_3 aq...	crystalline....
6	....	insoluble	insoluble	soluble acids; insol. alk.	orange red....
7	*	insoluble	....	soluble acids; insol. alk.	....
8	....	insoluble	decomp.	$35.^{20°}$alcohol; sol. HI,KI	black hexag...
9	dec. 75°–80°	decomp.	....	sol. a., $40^{19°}$ acetone ...	....
10	....	insoluble	....	soluble acids..........	hexag. plates .
11	....	insoluble	insoluble	soluble acids..........	....
12	....	insoluble	....	soluble acids; insol. alk.	yellow tetrag.
13	....	insoluble	....	soluble acids..........	brownish yel..
14	O_2, 357°	insoluble	....	soluble a., conc. KOH ..	brown........
15	O_2, 357°	insoluble	....	soluble a., conc. KOH ..	red ....
16	....	insoluble	....	soluble acids..........	....
17	....	insoluble	....	sol. a.; insol. $H_2C_4H_4O_6$	quadratic.....
18	....	insoluble	....	soluble acids..........	crystalline....
19	....	insoluble	....	soluble acids; insol. KI .	red crystalline.
20	....	insoluble	insoluble	sol. HCl; insol. dil. HNO_3	....
21	....	insoluble	....	insoluble alkalies	black ....
22	....	....	decomp.	soluble acids..........	needles.......
23	....	.000018	....	soluble HNO	brown rhomb.
24	†	$4.9^{21°}$	$28.7^{100°}$	$0.24^{25°}$ ether, sol. al. $28^{20°}$, $72^{100°}$ glycerene	triclinic monoclinic
25	sublimes 3500°	insoluble insoluble	insoluble insoluble	insol. al., ether; sol. conc. HNO_3, conc. H_2SO_4.	green amorph. monoclinic
26	90.5°	decomp.	....	decomp. by alcohol	....
27	....	insoluble	insoluble	insol. a.; dec. fused KNO_3	black crystals
28	18.2°	decomp.	....	decomp. by alcohol	....
29	–101°	105.7 c.c.$^{0°}$	....	decomp. by alcohol	....
30	....	s. soluble	....	soluble NH_4OH	....
31	210°	decomp.	....	v. soluble CS_2, CCl_4	cryst. plates ..
32	high temp.	$1.1^{0°}$	$16.4^{102°}$	soluble al., conc. a.....	....
33	....	insoluble	insoluble	insoluble, all solvent....	....
34	....	decomp.	....	s. soluble, PCl_3, SCl_2....	crystals......
35	....	decomp.	....	....	crystalline....
36	130°	soluble	....	....	....
37	....	v. soluble	decomp.	....	....
38	58.7°	$4.17^{0°}$	$3.49^{50°}$	sol. alk., CS_2, ether, al., $CHCl_3$, KBr, H_2O	brown red .... [crystals
39	‡	soluble	....	soluble CS_2, ether.....	yellow brown
40	130–140°	decomp.	....	decomp. by alk.......	prisms.......

‡ Decomposes above 10°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water=1. Air=1 (A). H_2=1 (D).	Melting Point, °C.
1	Bromine hydrate	$Br_2.10H_2O$	340.00	....	dec. 15°
2	Cadmium	Cd	112.4	$8.642^{17°}$	321°
3	acetate	$Cd(C_2H_3O_2)_2.3H_2O$	284.50	2.01	....
4	borotungstate	$Cd_2B_2W_9O_{32}.18H_2O$	2739.1	....	....
5	bromate	$Cd(BrO_3)_2.H_2O$	398.26	3.758	decomp.
6	bromide	$CdBr_2$	272.24	5.192^{25}_{4}	568°
7	carbonate	$CdCO_3$	172.40	4.258	decomp.
8	chlorate	$Cd(ClO_3)_2.2H_2O$	315.35	....	80°
9	chloride	$CdCl_2$	183.32	4.05^{25}_{4}	563°
10	"	$CdCl_2.2H_2O$	219.35	3.327	....
11	cyanide	$Cd(CN)_2$	164.42	....	dec. 200°
12	ferrocyanide	$Cd_2Fe(CN)_6$	436.70	....	....
13	fluoride	CdF_2	150.40	6.64	520
14	formate	$Cd(CHO_2)_2.H_2O$	220.43	2.45	decomp.
15	hydroxide	$Cd(OH)_2$	146.42	$4.79^{15°}$	H_2O, 300°
16	iodate	$Cd(IO_3)_2$	462.24	5.644–5.98	decomp.
17	iodide	CdI_2	366.24	5.644	385°
18	lactate	$Cd(C_3H_5O_3)_2$	302.48	....	....
19	nitrate	$Cd(NO_3)_2.4H_2O$	308.48	2.455	59.5°
20	oxalate	$CdC_2O_4.3H_2O$	254.45	$3.32^{18°}$ *	decomp.
21	oxide	CdO	128.40	6.95	infusible
22	"	CdO	128.40	8.11	"
23	oxide sub-	Cd_4O	465.6	$8.21–8.18^{19°}$	decomp.
24	permanganate	$Cd(MnO_4)_2.6H_2O$	458.36	....	decomp.
25	phosphate	$Cd_3(PO_4)_2$	527.28	....	....
26	potassium iodide	$CdI_2.2KI.2H_2O$	734.29	3.359	....
27	selenate	$CdSeO_4.2H_2O$	291.63	3.632	....
28	sulphate	$CdSO_4$	208.47	$4.72^{15°}$	1000°
29	"	$3CdSO_4.8H_2O$	769.54	$3.087^{25°}_{4}$	....
30	"	$CdSO_4.4H_2O$	280.53	3.05	....
31	sulphide artificial	CdS	144.47	3.9–4.8	white heat
32	" greenockite	CdS	144.47	4.8–4.9	....
33	sulphite	$CdSO_3$	192.47	....	decomp.
34	tungstate	$CdWO_4$	360.40	....	....
35	Caesium	Cs	132.81	$1.87^{20°}$	26.37°
36	bromide	CsBr	212.73	$4.455^{21.4°}$	....
37	bromoiodide	$CsBrI_2$	466.57	....	....
38	carbonate	Cs_2CO_3	325.62	....	....
39	carbonate acid	$CsHCO_3$	193.818	....	$\frac{1}{2}CO_2$, 175°
40	chloraurate	$CsAuCl_4$	471.85	....	....
41	chloride	CsCl	168.27	3.972^{20}_{4}	646°
42	chloroplatinate	Cs_2PtCl_6	673.58	....	....
43	chromate	$CsCrO_4$	248.81	4.237	....

* Anhydrous.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	soluble	....	....	red octahedra.
2	778°	insoluble	insoluble	sol. a., NH_4NO_3	crystalline....
3	....	v. soluble	....	....	monoclinic....
4	....	$1250^{19°}$	....	....	....
5	....	$125^{17°}$	....	....	triclinic....
6	806°–812°	$61.1^{0°}$	$161^{100°}$	$26.6^{15°}$ al., $0.4^{15°}$ ether	crystalline....
7	....	insoluble	insoluble	sol. acid, NH_4 salts	....
8	....	$339^{0°}$	$549^{65°}$	soluble acids....	....
9	861°–954°	$140^{20°}$	$150^{100°}$	$1.52^{15°}$ alcohol....	hexagonal....
10	....	$168^{20°}$	$180^{100°}$	$2.05^{15°}$ methyl alcohol .	monoclinic....
11	....	$1.7^{15°}$	....	sol. KCN, NH_4OH, a..	crystalline....
12	....	insoluble	....	sol. HCl....	....
13	1000°	$4.36^{15°}$	....	insol. al.; sol. acids....	crystalline....
14	....	v. soluble	....	.... [salts	monoclinic....
15	....	$0.00026^{25°}$	....	insol. alk.; sol. a., NH_4	hexagonal....
16	....	s. soluble	s. soluble	soluble HNO_3, NH_4OH.	crystalline....
17	708°–719°	$80.1^{0°}$	$128^{100°}$	sol. al., ether, NH_4OH .	brownish....
18	....	10	12.5	insoluble alcohol....	needles....
19	132°	$143.4^{0°}$	....	sol. al.; insol. HNO_3....	prism. needles.
20	....	$0.00337^{18°}$	0.009	sol. a., NH_3aq....	....
21	....	insoluble	insoluble	soluble acid, NH_4 salts	brown amorph.
22	....	insoluble	insoluble	insol. alk....	regular....
23	....	....	....	decomp. by alk., acids .	green amorph.
24	....	v. soluble	....	....	....
25	....	insoluble	....	soluble NH_4 salts, acids.	amorphous ...
26	....	$137^{15°}$	....	$71^{15°}$ al.; $42^{15°}$ ether....	....
27	....	v. soluble	....	....	rhombic....
28	....	$76.5^{0°}$	$60.8^{100°}$	....	....
29	....	$114.2^{0°}$	$87^{100°}$	....	monoclinic....
30	....	$140^{0°}$	$135.5^{100°}$	insoluble alcohol....	...[or amorph.
31	subl. 980°..	.00013	colloidal s.	v. s. sol. NH_4OH; sol. a..	yellow hexag..
32	....	insoluble	....	soluble conc. acids....	yellow hexag..
33	....	s. soluble	....	insol. al.; sol. a., NH_4OH	crystalline....
34	....	0.05	....	soluble NH_4OH....	yellow crystals
35	670°	decomp.	decomp.	soluble acids, alcohol ..	silvery yellow.
36	....	soluble	....	decomp. by alcohol....	....
37	....	decomp.	....	soluble alcohol....	....
38	dec. 610°	$382.3^{20°}$	v. soluble	$11.1^{19°}$, $20.1^{79°}$ alcohol.	....
39	....	210.2	v. soluble	sol. al....	rhomb. prisms
40	....	$0.5^{10°}$	$38^{100°}$	soluble alcohol....	....
41	....	$161.4^{0°}$	$270.5^{100°}$	soluble alcohol....	regular....
42	....	$0.024^{0°}$	$0.377^{100°}$	....	yellow regular.
43	....	$71.35^{13°}$	$88.66^{30°}$	....	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Caesium cyanide	$CsCN$	158.82	...	...
2	fluosilicate	Cs_2SiF_6	407.92	3.376^{17}_{17}	...
3	hydride	CsH	133.82	2.7	decomp.
4	hydroxide	$CsOH$	149.82	4.018	<272.3°
5	iodide	CsI	259.74	4.510^{25}_{4}	621°
6	mercuric bromide	$CsBr.2HgBr_2$	932.41	...	...
7	mercuric chloride	$CsCl.HgCl_2$	439.18	...	...
8	nitrate	$CsNO_3$	194.82	3.687^{28}_{4}	414°
9	oxide mon-	Cs_2O	281.62	4.78^{0}_{0}	*
10	" di-	Cs_2O_2	297.62	$4.47^{15°}$	400–450°
11	" tri-	Cs_2O_3	313.62	$4.25^{0°}$	400°
12	" tetr-(per-)	Cs_2O_4	329.62	$3.77^{19°}$	515°
13	pentasulphide	Cs_2S_5	425.97	$2.806^{16°}$	202°–205°
14	perchlorate	$CsClO_4$	232.27	...	decomp.
15	periodate	$CsIO_4$	323.74	4.259^{15}_{4}	...
16	permanganate	$CsMnO_4$	251.74	$3.5974^{10.3°}$	decomp.
17	silicotungstate	$Cs_8SiW_{12}O_{42}$	3970.8	...	...
18	sulphate	Cs_2SO_4	361.69	4.2434^{20}_{4}	...
19	sulphide	$Cs_2S.4H_2O$	369.75	...	...
20	" di-	Cs_2S_2	329.78	...	460°
21	" "	$Cs_2S_2.H_2O$	347.80	...	...
22	" tri-	Cs_2S_3	361.85	...	217°
23	tartrate acid	$CsHC_4H_4O_6$	281.85	...	...
24	Calcium	Ca	40.07	$1.5446^{29.2°}$	805°
25	acetate	$Ca(C_2H_3O_2)_2.H_2O$	176.13	...	decomp.
26	aluminate	$CaAl_2O_4$	158.28	$3.671^{20°}$	1587°
27	ammonium arsenate	$NH_4Ca.AsO_4.6H_2O$	305.17	$1.905^{15°}$	decomp.
28	" phosphate	$CaNH_4PO_4.7H_2O$	279.26	$1.561^{15°}$	decomp.
29	arsenide	Ca_3As_2	270.13	$2.5^{15°}$	decomp.
30	borate	$Ca(BO_2)_2.2H_2O$	162.10	...	...
31	boride	CaB_6	106.07	$2.33^{15°}$	...
32	bromide	$CaBr_2$	199.91	$3.353^{25}_{4}°$	485°–760°
33	"	$CaBr_2.6H_2O$	308.18	...	38°
34	carbide	CaC_2	64.07	$2.22^{18°}$	...
35	carbonate	$CaCO_3$	100.07	2.72–2.95	dec. 825°
36	chlorate	[illegible]$(ClO_3)_2$	206.99	...	>100°
37	chloride	[illegible]	110.99	$2.152^{25}_{4}°$	774°
38	"	$CaCl_2.H_2O$	129.01	...	...
39	"	$CaCl_2.6H_2O$	219.09	1.654	29.48°
40	chromate	$CaCrO_4.2H_2O$	192.20	...	$2H_2O$,200°
41	citrate	$Ca_3(C_6H_7O_7)_2.4H_2O$	574.39	...	decomp.
42	ferrocyanide	$Ca_2Fe(CN)_6.12H_2O$	548.23	...	...

* Absorbs 30 at 150°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	....	....	insoluble alcohol......	....
2	....	60^{17°	v. soluble	insoluble alcohol......	regular.......
3	....	decomp.	decomp.	decomp. by acids.....	crystals.....
4	....	301.3^{30°	soluble	soluble alcohol.......	grayish.......
5	....	27.7^{0°	$51.5^{35.6^\circ}$	....	....
6	....	0.807^{16°	....	s. soluble alcohol.....	....
7	....	1.406^{17°	....	insoluble alcohol......	....
8	decomp.	9.33^{0°	197^{100°	s. soluble alcohol.....	cubic........
9	....	v. soluble	....	sol. abs. al...........	orange red crys.
10	†	soluble	....	....	yellow needles
11	....	decomp.	....	....	choc. brown..
12	decomp.	decomp.	....	....	yellow cryst.
13	....	....	....	soluble alcohol.......	....
14	....	insoluble	....	insol. absolute alcohol..	....
15	....	2.15^{15°	....	....	rhombic plates
16	....	0.097^{1°	1.25^{59°	....	....
17	....	0.005^{20°	0.52^{100°	insol. alcohol, HCl....	....
18	....	167^{0°	220.3^{100°	insoluble alcohol......	needles.......
19	....	v. soluble	v. soluble	....	crystals.....
20	>800°	hygroscopic	....	....	dark red amor.
21	....	soluble	....	....	quadratic crys.
22	>800°	....	....	....	orange.......
23	....	9.7^{25°	98^{100°	...............[benzol	[or rhombohed
24	....	decomp.	decomp.	sol. a., sodium; insol.	silvery hexag.
25	....	43.6^{0°	34.3^{100°	s. soluble alcohol.....	needles...[dles
26	....	decomp.	....	insol. benzine; sol. HCl.	prismatic nee-
27	....	0.02	soluble	insol. NH_4OH; sol. NH_4Cl	monocl. plates
28	....	insoluble	insoluble	soluble acids.........	monoclinic....
29	....	decomp.	decomp.	soluble acids.........	reddish cryst..
30	....	0.40^{30°	0.40^{90°	soluble acids, NH_4 salts	....
31	....	insoluble	insoluble	soluble HNO_3........	black regular .
32	806°–812°	125^{0°	312^{105°	v. soluble alcohol.....	needles.......
33	149°–150°	50^{0°	....	....	....
34	....	decomp. to	C_2H_2	....	crystalline....
35	....	0.0013	0.088	[illegible] :sol.a., NH_4Cl	rhombic ‡....
36	....	177.7^{8°	....	[illegible]l.......	rhombic.....
37	....	59.5^{0°	154^{99°	[illegible]	....
38	....	69.1^{0°	205^{99°	solu[illegible]ohol.......	....
39	129°–130°	117.4^{0°	....	soluble alcohol.......	hexagonal....
40	....	22.2^{0°	4.3^{100°	sol. alcohol, acids.....	yellow prisms.
41	....	0.085^{18°	0.096^{25°	0.0065^{18° alcohol.....	needles.......
42	....	....	50^{90°	....	triclinic.....

† Loses oxygen at 650°. ‡ Also hexagonal or rhombohedral.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Calcium fluoride	CaF_2	78.07	3.15–3.18	1300°
2	fluosilicate	$CaSiF_6$	183.37	$2.662^{17.5°}$	....
3	formate	$Ca(CHO_2)_2$	130.09	2.021	decomp.
4	hydride	CaH_2	42.09	1.7	....
5	hydroxide	$Ca(OH)_2$	74.09	2.078	....
6	hypochlorite	$Ca(ClO)_2.4H_2O$	215.05	....	decomp.
7	hypophosphate	$Ca_2P_2O_6.2H_2O$	274.25	....	....
8	hypophosphite	$Ca(H_2PO_2)_2$	170.16	....	....
9	iodate	$Ca(IO_3)_2$	389.91	....	decomp.
10	iodide	CaI_2	293.91	3.956^{25}_{4}	631°–740°
11	"	$CaI_2.6H_2O$	402.01	....	42°
12	lactate	$Ca(C_3H_5O_2)_2.5H_2O$	276.23	....	$3H_2O$,100°
13	nitrate	$Ca(NO_3)_2$	164.09	2.36	561°–499°
14	"	$Ca(NO_3)_2.4H_2O$	236.15	1.82	42.31°
15	nitrid	Ca_3N_2	148.23	$2.63^{17°}$	1200°
16	nitrite	$Ca(NO_2)_2.H_2O$	150.11	$2.231^{34°}$	....
17	oxalate	$CaC_2O_4.H_2O$	146.09	$2.2^{4°}$ *	decomp.
18	oxide	CaO	56.07	3.15–3.40	1995°
19	permanganate	$Ca(MnO_4)_2.4H_2O$	329.99	....	decomp.
20	peroxide	$CaO_2.8H_2O$	216.20	....	$8H_2O$,130°
21	phosphate	$Ca_3(PO_4)_2$	310.29	3.18	....
22	" di-	$CaHPO_4.2H_2O$	172.15	$2.306^{16.5°}_{4}$	decomp.
23	" mono-	$CaH_4(PO_4)_2.H_2O$	252.20	$2.220^{16°}_{4}$	H_2O,100°
24	" pyro-	$Ca_2P_2O_7.4H_2O$	326.28	....	....
25	phosphide	Ca_3P_2	182.29	$2.51^{15°}$	dif. fusible
26	phosphite	$2CaHPO_3.3H_2O$	294.28	....	....
27	plumbate	Ca_2PbO_4	351.04	....	....
28	plumbite	$CaPbO_2$	278.98	....	....
29	potassium sulphate	$CaK_2(SO_4)_2.H_2O$	328.43	$2.6^{17°}$	....
30	salicylate	$Ca(C_7H_5O_3)_2.2H_2O$	350.18	....	....
31	silicate	$CaSiO_3$	116.37	$2.919^{18°}$	1512°
32	silicide	$CaSi_2$	96.68	2.5	....
33	sulphate	$CaSO_4$	136.14	2.964	1360°
34	" (gypsum)	$CaSO_4.2H_2O$	172.17	2.32	$2H_2O$,900°
35	sulphydrate	$Ca(SH)_2.6H_2O$	214.32	....	dec. 15–18
36	sulphide	CaS	72.14	$2.8^{15°}$	fusible
37	sulphite	$CaSO_3.2H_2O$	156.17	....	$2H_2O$,100°
38	sulphocarbonate	$CaCS_3$	148.28	....	....
39	sulphocyanate	$Ca(CNS)_2.3H_2O$	210.28	....	....
40	tartrate	$CaC_4H_4O_6.4H_2O$	260.17	....	decomp.
41	thiosulphate	$CaS_2O_3.6H_2O$	260.31	1.872	....
42	tungstate	$CaWO_4$	288.07	6.062	....

* Density of the anhydrous salt.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	$0.0016^{18°}$	....	s. soluble conc. acids...	regular.......
2	....	s. soluble	....	soluble HF, HCl, al.....	....
3	....	$16^{0°}$	$18.4^{100°}$	insoluble alcohol.......	rhombic......
4	....	decomp.	decomp.	insol. benzine; dec. by a.	crystalline....
5	....	$0.17^{0°}$	$0.08^{100°}$	sol. NH_4Cl	hexagonal....
6	....	deliques.	decomp.	....	....
7	....	insoluble	....	soluble $H_4P_2O_6$, HCl....	....
8	....	17	....	insoluble alcohol.......	monoclinic ...
9	....	$0.4^{15°}$	$1.33^{100°}$	soluble HNO_3.........	rhombic......
10	708°–719°	$192^{0°}$	$435^{92°}$	soluble acids, al........	plates........
11	160°	$907^{0°}$	....	....	....
12	....	10.5	....	insol. ether; sol. alcohol	....
13	....	$93.1^{0°}$	$351.2^{152°}$	14^{15} alcohol; sol. amyl. al	prisms.......
14	132°	$134^{0°}$	$506^{152°}$	0.8 alcohol..........	monoclinic....
15	....	decomp.	decomp.	sol.dil.acids; insol.ab.al.	brown crystals
16	....	deliques.	v. soluble	insoluble alcohol......	prisms.......
17	....	$0.000554^{18°}$	$0.0014^{95°}$	sol. a.; insol. $H.C_2H_3O_2$.	octahedral....
18	....	$0.13^{0°}$	$0.06^{100°}$	soluble acids..........	regular.......
19	....	$331^{14°}$	$388^{25°}$	............[NH_4 salts	purple prisms.
20	....	s. soluble	decomp.	insol. al., ether; sol. a.,	tetragonal....
21	....	0.003–0.008	decomp.	soluble acids; insol. al...	amorphous ...
22	....	0.028	decomp.	insol. al.; sol $H_4C_6H_7O_7$	monocl. plates.
23	dec. 200°	$4^{15°}$	decomp.	....	rhombic......
24	....	s. soluble	....	soluble a.; insol. NH_4Cl.	crystalline....
25	....	decomp.	....	insol. al., ether; sol. dil.a	red crystals...
26	....	s. soluble	decomp.	sol. NH_4Cl; insol. al....	....
27	....	insoluble	....	soluble acids..........	brown crystals
28	....	s. soluble	....	....	crystalline....
29	....	0.25	decomp.	soluble acids..........	monoclinic....
30	....	v. soluble	....	soluble alcohol........	octahedral....
31	....	$0.0095^{17°}$	....	soluble HCl...........	monocl. or hex-
32	....	insoluble	....	....	.......[agonal
33	....	$0.179^{0°}$	$0.178^{100°}$	sol. a., $Na_2S_2O_3$, NH_4 salts	rhombic......
34	....	$0.241^{0°}$	$0.222^{100°}$	sol. HCl, NaCl, glycerine	monoclinic....
35	....	v. soluble	....	soluble alcohol........	prismatic.....
36	....	$0.15^{10°}$	$0.33^{90°}$	soluble acids..........	regular.......
37	....	0.125	....	soluble H_2SO_3.........	crystalline....
38	....	soluble	....	soluble alcohol........	yellow......
39	....	deliques.	v. soluble	v. soluble alcohol......	crystalline....
40	....	$0.016^{15°}$	$0.3^{100°}$	s. soluble alcohol......	trimetr. prisms
41	....	$100^{3°}$	decomp.	insoluble alcohol.......	triclinic......
42	....	0.2	....	insoluble a.; sol. NH_4Cl.	tetragonal....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water=1. Air=1 (A). H_2=1 (D).	Melting Point, °C.
1	**Carbon** amorphous	C	12.00	1.75–2.10	sublimes at 3500°
2	" graphite	C	12.00	2.255^{15}_{4}	
3	" diamond	C	12.00	3.47–3.5585	
4	bromide di-	C_2Br_4	343.72	....	53°
5	" tri-	C_2Br_6	503.52	....	....
6	" tetra-	CBr_4	331.72	$3.42^{14°}$	92°
7	chloride di-	C_2Cl_4	165.84	$1.62^{20°}$.	....
8	" tri-	C_2Cl_6	236.76	1.6298; 8.15 A.	182°
9	" tetra-	CCl_4	153.84	1.5817^{21}_{4}	−23.77°
10	dioxide gaseous	CO_2	44.00	1.53A.	....
11	" liquid	CO_2	44.00	$1.057^{-34°}$	−65°
12	" solid	CO_2	44.00	$1.56^{-79°}$	−65°
13	disulphide	CS_2	76.14	1.292^{0}_{4} 2.63A	−110°
14	iodide	CI_4	519.68	$4.32^{20.2°}$	decomp.
15	monoxide	CO	28.00	0.9670A.	− 203°
16	monosulphide	CS	44.07	1.66	decomp.
17	oxybromide..[gene)	$COBr_2$	187.84	$2.48^{0°}$	....
18	oxychloride (phos-	$COCl_2$	98.92	$1.432^{0°}$	....
19	oxysulphide	COS	60.07	2.10 A.; 30.4 D.	decomp.
20	silicide	CSi_2	68.6	2.5	....
21	thionyl chloride	$CSCl_2$	114.99	$1.5085^{15°}$	....
22	" perchloride	$CSCl_4$	185.91	$1.712^{12.8°}$	....
23	**Cerium**	Ce	140.25	$6.92^{25°}$	645°
24	**Ceric** carbide	CeC_2	164.25	5.23	....
25	fluoride	$CeF_4.H_2O$	234.27	....	decomp.
26	hydroxide	$2CeO_2.3H_2O$	398.55	....	....
27	nitrate	$Ce(NO_3)_4$	388.29	....	....
28	oxide	CeO_2	172.25	7.65	....
29	peroxide	CeO_3	188.25	....	....
30	silicide	$CeSi_2$	196.85	$5.67^{17°}$	....
31	sulphate	$Ce(SO_4)_2.4H_2O$	404.45	....	....
32	**Cerous** acetate	$Ce_2(C_2H_3O_2)_6.3H_2O$	688.69	....	$3H_2O$,115°
33	bromide	$CeBr_3.H_2O$	398.03	....	decomp.
34	carbonate	$Ce_2(CO_3)_3.9H_2O$	622.64	....	decomp.
35	chloride	$CeCl_3$	246.63	$3.88^{15.5}_{15.5}$	848°
36	fluoride	$CeF_3.\frac{1}{2}H_2O$	206.26	....	....
37	hydroxide	$Ce_2O_3.6H_2O$	436.60	....	....
38	iodide	$CeI_3.9H_2O$	683.15	....	....

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	insoluble	insoluble in acids	black amorph.
2	....	insoluble	insoluble	alkalies; soluble in....	black hexag...
3	....	insoluble	insoluble	molten metals	regular.......
4	....	....	....	....	....
5	....	....	....	sol. CS_2; insol. al., ether	....
6	189.5°	insoluble	....	sol. al., ether, $CHCl_3$...	tablets.......
7	121°	....	....	....	....
8	187°	insoluble	....	soluble alcohol, ether ..	rhombic, triclinic or reg.
9	76.74°	insoluble	....	....	....
10	....	179.67c.c.$^{0^\circ}$	90.14c.c.$^{20^\circ}$	283 c.c.$^{22.6^\circ}$ al., sol. alk..	....
11	−78.2°	insoluble	....	soluble alcohol, ether ..	....
12	−78.2°	....	....	....	crystalline....
13	46.2°	0.2$^{0^\circ}$	0.014$^{50^\circ}$	soluble alcohol, ether...	....
14	....	....	decomp.	soluble al., CS_2, ether ..	octahedra....
15	−190°	3.5c.c.$^{0^\circ}$ 0.0044$^{0^\circ}$	1.6c.c.$^{50^\circ}$ 0.0018$^{50^\circ}$	0.20566$^{16^\circ}$ al.sol. Cu_2Cl_2 CS_2, C_6H_6, $H.C_2H_3O_2$	....
16	200°	insoluble	....	insol. al.; sol. CS_2, ether	red powder...
17	63–66°	....	....	....	....
18	8.2°	decomp.	....	sol.glac.$HC_2H_3O_2$;dec. al	....
19	−47°	133$^{0^\circ}$	40.3$^{30^\circ}$	v. soluble alcohol, alk..	....
20	....	decomp.	decomp.	insol. al., ether; sol. conc.	grayish cryst .
21	70°	....	....	.........[HNO_3, HS_2O_4	golden red....
22	146–147°	....	decomp.	....	golden yellow.
23	....	insoluble	insoluble	sol. dil. a.; insol. conc. a.	steel gray.....
24	....	decomp.	decomp.	soluble acids..........	reddish hexag.
25	....	insoluble	....	....	amorphous ...
26	....	soluble acids	insol. alk.	s. sol. alk., carbonate aq	....
27	....	deliques.	decomp.	soluble alcohol........	reddish yellow
28	....	insoluble	insoluble	sol. conc. H_2SO_4.......	yellow tesseral.
29	....	....	....	....	red..........
30	....	insoluble	....	....	....
31	....	soluble	....	....	yellow needles
32	decomp.	26.45$^{15^\circ}$	16.2$^{76^\circ}$	....	needles.......
33	....	deliques.	....	soluble alcohol........	needles.......
34	....	insoluble	....	soluble $(NH_4)_2CO_3$....	....
35	....	100	decomp.	30 alcohol...........	crystals.......
36	....	insoluble	....	....	....
37	....	sol. acids	insol. alk.	sol. $(NH_4)_2CO_3$; insol. alk.	....
38	....	soluble	....	soluble alcohol........	crystalline....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Cerous nitrate	$Ce(NO_3)_3.6H_2O$	435.24		$3H_2O$,150°
2	oxalate	$Ce_2(C_2O_4)_3.9H_2O$	706.64		decomp.
3	oxide	Ce_2O_3	328.50	6.9–7.0	
4	oxychloride	$Ce_2O_3.2CeCl_3$	821.76		
5	phosphate	$CePO_4$	235.29	3.8	
6	sulphate	$Ce_2(SO_4)_3$	568.71	3.912	
7	"	$Ce_2(SO_4)_3.8H_2O$	712.84	3.220	$8H_2O$,630°
8	sulphide	Ce_2S_3	376.71	$5.020^{110°}$	decomp.
9	Chloric Acid	$HClO_3.7H_2O$	210.58	$1.282^{14°}$	$< -20°$
10	Chlorine	Cl_2	70.92	$2.491^{0°}$A.	−102°
11	hydrate	$Cl.5H_2O$	125.54	1.23	−50°
12	oxide mon-	Cl_2O	86.92	2.977A.	−20°
13	" di- or per-	ClO_2	67.46	1.5, 2.315A.	−79°
14	" hept-	Cl_2O_7	182.92		
15	Chlorosulphonic Acid	$ClSO_2.OH$	116.54	1.784^{0}_{4}	82°
16	Chromium	Cr	52.0	$6.92^{20°}$	1505°
17	boride	CrB	63.0	$5.4^{17°}$	
18	dioxide	CrO_2	84.00		190,O,300
19	phosphide	CrP	83.00	$5.71^{15°}$	
20	tetrasulphide	Cr_3S_4	234.28		
21	trioxide	CrO_3	100.00	2.67–2.82	196°
22	Chromic bromide	$CrBr_3$	291.76		
23	" "	$CrBr_3.6H_2O$	399.86		
24	carbide	Cr_3C_2	180.0	5.62	
25	chloride	$CrCl_3$	158.38	$2.757^{15°}$	
26	"	$CrCl_3.6H_2O$	266.48		sublimes 83°
27	fluoride	CrF_3	109.0	3.78	decomp.
28	"	$CrF_3.9H_2O$	271.14		
29	hydroxide	$Cr(OH)_3$	103.02		
30	nitrate	$Cr(NO_3)_3.9H_2O$	400.17		37°
31	nitride	CrN	66.01		dec. 1500°
32	oxide	Cr_2O_3	152.00	5.04	2059°
33	phosphate	$Cr_2(PO_4)_2.6H_2O$	402.18		
34	"	$Cr_2(PO_4)_2.12H_2O$	510.27	2.121	$7H_2O$,100°
35	silicide	Cr_3Si_2	212.60	5.6	
36	sulphate	$Cr_2(SO_4)_3$	392.21	3.012	
37	"	$Cr_2(SO_4)_3.\ 5H_2O$	482.29		
38	"	$Cr_2(SO_4)_3.\ 15H_2O$	662.45	$1.867^{17°}$	100
39	"	$Cr_2(SO_4)_3.\ 18H_2O$	716.50		
40	sulphide	Cr_2S_3	200.21	$3.77^{19°}$	

* Decomposes at 200°. † Decomposes at 40°.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	*	deliques.	v. soluble	50 alcohol	red crystals....
2	....	$.053^{25°}$	....	insoluble oxalic acid ...	....
3	....	insoluble	....	soluble conc. H_2SO_4....	gray powder ...
4	....	insoluble	....	soluble dilute acids	purple ....
5	....	insoluble	insoluble	soluble acids..........	monocl. prisms.
6	....	$16.56^{0°}$	$2.25^{100°}$	....	[or rhombic
7	....	$23.8^{0°}$	$6^{50°}$	....	monocl.,triclinic
8	....	insoluble	decomp.	soluble dilute acids.....	red crystals ...
9	†	v. soluble	....	....	....
10	−33.6°	$150^{0°}$, $300^{10°}$	$180^{30°}$ c.c.	soluble alkalies........	greenish yellow.
11	‡	soluble	....	....	octahedra.....
12	−5°	200c.c.$^{0°}$	....	....	reddish yellow .
13	9.9°	2000c.c.$^{4°}$	decomp.	sol. conc. H_2SO_4, alk. ..	yellowish green.
14	82°	soluble	....	sol. benzene...........	oil ....
15	155.3°	decomp.	....	insol. CS_2; decomp. al ..	....
16	2200°	insoluble	insoluble	sol.HCl,dil.H_2SO_4; insol.	gray cryst. ....
17		insoluble	insoluble	sol. fused Na_2O_2 [HNO_3	silver cryst. ...
18	....	insoluble	....	....	dark gray......
19	....	insoluble	....	insol. a.; sol. HNO_3,HF.	gray black crys.
20	....	insoluble	....	s. soluble conc. acids...	gray blk.powder
21	decomp.	$163.4^{0°}$	$206.7^{100°}$	sol. al., ether, H_2SO_4 ...	red triclinic....
22	....	insoluble	....	....	olive green hex.
23	....	200	....	v. soluble alcohol......	green hexag. pl.
24	....	insoluble	insoluble	sol. dil. HCl..........	gray crystals ..
25	1200–1500°	insoluble	s. soluble	insol. a.; sol. trace $CrCl_2$.	pink crystals...
26	....	v. soluble	....	soluble alcohol........	violet plates . gr. hexag. pl..
27	....	insoluble	....	insol. al.; s. sol. acids ..	greenish octah..
28	....	v. soluble	....	insoluble al.; sol. a......	..[-blue gelatin.
29	....	insoluble	....	sol. a., alk.; s. sol.NH_3aq	gray-green or
30	125.5°	soluble	....	....	purple prisms..
31	....	insoluble	....	insol. acids, alkalies	amorphous....
32	....	insoluble	....	s. soluble acids........	dark green hex.
33	....	s. soluble	....	sol. acids, alk.;......	green.........
34	....	s. soluble	....	insol. $H.C_2H_3O_2$......	violet triclinic..
35	....	insoluble	insoluble	sol.HCl, HF.; insol. HNO_3, H_2SO_4	tetragonal prisms......
36	....	insoluble	....	insoluble acids........	....
37	....	....	....	v. soluble alcohol......	green amorph...
38	$10H_2O$,100°	....	decomp.67°	insoluble alcohol.......	violet cryst. ...
39	....	$120^{20°}$	....	....	blue octahed. ..
40	....	insoluble	decomp.	soluble HNO_3.........	brn. black pow.

‡ Decomposes at 35°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Chromous acetate...	$Cr_2(C_2H_3O_2)_6.2H_2O$..	494.18	....	....
2	carbonate.........	$CrCO_3$.............	112.00	....	....
3	chloride..........	$CrCl_2$.............	122.92	$2.751^{14°}$	....
4	fluoride..........	CrF_2..............	90.0	4.11	1100°
5	hydroxide........	$Cr(OH)_2$...........	86.02	....	....
6	iodide............	CrI_2..............	305.84	....	....
7	sulphate..........	$CrSO_4.7H_2O$........	274.18	....	....
8	sulphide..........	CrS..............	84.07	4.08	....
9	Chromyl trichloride .	CrO_2Cl_2...........	154.92	1.9617^{0}_{4}	....
10	Cobalt............	Co...............	58.97	8.718^{21}_{4}	1490°
11	carbonyl..........	$Co(CO)_4$..........	170.97	$1.827^{18°}$	42–46°
12	phosphide........	Co_2P.............	148.98	$6.4^{15°}$	....
13	Cobaltic boride......	CoB..............	69.97	$7.25^{18°}$	....
14	chloride..........	$CoCl_3$............	165.38	2.94	sublimes
15	" dichro-...	$Co(NH_3)_3Cl_3.H_2O$...	234.50	....	....
16	" praseo-...	$Co(NH_3)_4Cl_3.H_2O$...	251.53	....	....
17	" purpureo-.	$Co(NH_3)_5Cl_3$.......	250.57	$1.802^{15°}$	....
18	" luteo-....	$Co(NH_3)_6Cl_3$.......	267.58	$1.7016^{20°}$	....
19	" roseo-....	$Co(NH_3)_5Cl_3.H_2O$...	268.57	....	....
20	chromate.........	$2CoO.CrO_3.2H_2O$ ...	286.03	....	....
21	hydroxide........	$Co(OH)_3$..........	110.02	....	....
22	oxide............	Co_2O_3............	166.00	4.81–5.60	0.895°
23	potassium nitrite..	$2Co(NO_2)_3.6KNO_2.3H_2O$	958.71	....	....
24	sulphate..........	$Co_2(SO_4)_3$.........	406.15	....	....
25	sulphide..........	Co_2S_3.............	214.15	4.8	....
26	" di-.......	CoS_2..............	123.11	4.269	....
27	Cobaltocobaltic oxide	Co_3O_4............	240.91	5.8–6.3	0.905
28	Cobaltous acetate...	$Co(C_2H_3O_2)_2.4H_2O$..	249.08	$1.7043^{18.7°}$	....
29	am. chloride	$CoCl_2.NH_4Cl.6H_2O$..	291.49	....	....
30	" sulphate......	$CoSO_4.(NH_4)_2SO_4.6H_2O$	395.28	$1.902^{18°}$	....
31	arsenate..........	$Co_3(AsO_4)_2.8H_2O$....	598.96	2.948	....
32	arsenite..........	$Co_3H_6(AsO_3)_4.H_2O$..	692.81	....	....
33	bromate..........	$Co(BrO_3)_2.6H_2O$.....	454.91	....	....
34	bromide..........	$CoBr_2$.............	218.81	4.909^{25}_{4}	....
35	"	$CoBr_2.6H_2O$........	326.91	....	100°
36	carbonate........	$CoCO_3$............	118.97	....	decomp.
37	" basic ...	$2CoCO_3.3Co(OH)_2$..	516.90	....	....
38	chlorate..........	$Co(ClO_3)_2.6H_2O$.....	334.00	....	50°
39	chloride..........	$CoCl_2$.............	129.89	3.348^{25}_{4}	sublimes
40	"	$CoCl_2.6H_2O$........	238.00	1.84	86.75°
41	chromate..........	$CoCrO_4$............	174.97	....	decomp.

* Decomposes at 100°.

Number.	Boiling Point, °C.	Solubility in 100 parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1		soluble		insoluble alcohol	green
2		insoluble		insoluble ether	amorphous
3		v. soluble			crystalline
4		s. soluble		insol. al.; sol. hot HCl	green crystals
5		decomp.		soluble acids	yellow brown
6		v. soluble			
7		12.35^{0°		s. soluble alcohol	blue
8		insoluble		v. soluble acids	black powder
9	115.9°	decomp.			dark red
10		insoluble	insoluble	soluble acids	
11	dec. 135°	insoluble		Sol. CS_2, ether, al.	
12		insoluble	insoluble	sol. conc. HNO_3	small needles
13		decomp.	decomp.	soluble HNO_3	prisms
14		soluble	soluble		
15		soluble		soluble acids, alcohol	
16		v. soluble		soluble acids; insol. al.	green crystals
17		0.232^{0°	$1.031^{46.6^\circ}$	insoluble alcohol	
18		4.26^{0°	$12.74^{46.6^\circ}$	insoluble al., NH_3 aq.	
19		16.12^{0°	$24.87^{16.19^\circ}$	s. soluble HCl	brick red
20		decomp.			
21		insoluble	insoluble	insol.al.; sol.conc.cold a.	black
22	heat	insoluble	insoluble	soluble conc. acids	steel gray
23		s. soluble		insol. alcohol, ether	yellow prisms
24		sol. with dec.		soluble conc., H_2SO_4	blue cryst. powder
25		insoluble		decomp. by acids	black crystals
26		insoluble		sol. HNO_3, aqua regia	black
27		insoluble	insoluble	sol. conc. H_2SO_4	black
28		soluble			red needles
29		deliques.	v. soluble		ruby red
30		20.5^{20°	45.4^{80°	insoluble alcohol	
31		insoluble	insoluble	soluble acids, NH_3aq	reddish monocl.
32		insoluble		soluble acids	rose red
33		45.5^{17°		soluble NH_3aq	hyacinth. octa.
34		66.7^{59°	68.1^{97°	soluble alcohol, ether	
35		deliques.	153.2^{97°	soluble alcohol, ether	green
36		insoluble	insoluble	insol. conc. HCl, HNO_3	red rhombohed.
37		insoluble	decomp.	sol. $(NH_4)_2CO_3$	red colored
38	*	558.3^{0°	soluble	soluble alcohol	regular
39		45^{7°	105^{96°	31 al., 8.62 acetone	blue crystals
40	†	76.7^{0°	190.7^{100°	v. sol. ether, glycoll	red monoclinic
41		insoluble		sol. a., NH_3aq., dil. HNO_3	yellowish brown

† Loses $6H_2O$ at 110°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Cobaltous cyanide	$Co(CN)_2.2H_2O$	147.02	....	$2H_2O$,280°
2	ferricyanide	$Co_3[Fe(CN)_6]_2$	600.89	....	....
3	ferrocyanide	$Co_2Fe(CN)_6.7H_2O$	455.95	....	....
4	fluoride	$CoF_2.2H_2O$	133.00	4.43 *	....
5	"	$CoF_2.5HF.6H_2O$	305.10	2.086	....
6	hydroxide	$Co(OH)_2$	93.00	$3.597^{15°}$	....
7	iodate	$Co(IO_3)_2$	408.81	$5.008^{18°}$	....
8	iodide	CoI_2	312.81	....	....
9	"	$CoI_2.2H_2O$	348.84	....	....
10	"	$CoI_2.6H_2O$	420.91	....	....
11	nitrate	$Co(NO_3)_2.6H_2O$	291.09	$1.83^{14°}$	56°
12	oxalate	$CoC_2O_4.2H_2O$	183.00	$2.325^{19°}$ *	....
13	oxide	CoO	74.97	5.6–5.75	0.2860°
14	perchlorate	$Co(ClO_4)_2$	257.89	3.327	....
15	phosphate	$Co_3(PO_4)_2$	366.99	....	....
16	"	$Co_3(PO_4)_2.3H_2O$	421.04	....	....
17	phosphite	$CoHPO_3.2H_2O$	175.05	....	blue at 250
18	potass. carbonate	$CoCO_3.KHCO_3.4H_2O$	291.14	....	....
19	selenide	$CoSe$	138.17	7.65	red heat
20	silicate	Co_2SiO_4	210.24	4.63	....
21	sulphate	$CoSO_4$	155.04	$3.472^{15°}$	989°
22	"	$CoSO_4.7H_2O$	281.15	$1.918^{15°}$	96.8°
23	sulphide	CoS	91.04	5.45	> 1100°
24	sulphite	$CoSO_3.5H_2O$	229.12	....	....
25	Columbic Acid	$3Cb_2O_5.7H_2O$	927.11	....	....
26	Columbium (Niobium)	Cb	93.5	7.06^{15}_{15}	1950° §
27	bromide	$CbBr_5$	493.10	....	....
28	chloride penta-	$CbCl_5$	270.80	$2.75^{20°}$	194°
29	hydride	CbH	94.51	6–6.6	decomp.
30	nitride	CbN	107.51	....	....
31	oxalate	$Cb(HC_2O_4)_5$	538.54	....	....
32	oxide mon-	CbO	219.50	6.3–6.67	....
33	" di-	CbO_2	125.50	....	....
34	" pent-	Cb_2O_5	267.00	4.4–4.53	....
35	oxybromide	$CbOBr_3$	349.26	....	sublimes
36	oxychloride	$CbOCl_3$	215.88	....	subl. 400°
37	oxysulphide	Cb_2OS_3	299.21	....	....
38	Copper	Cu	63.57	8.91–8.96	1083° ¶
39	boride	Cu_3B_2	212.63	8.116	....
40	hydride	Cu_2H_2	129.16	....	dec. 60°
41	nitride	Cu_3N	204.72	....	dec. 300°

* Density of the anhydrous salt. † Decomposes at red heat.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	....	sol. KCN, HCl, NH_3aq.	buff colored...
2	....	insoluble	....	insol. HCl; sol. NH_3aq.	red..........
3	....	insoluble	....	insol. HCl; sol. KCN...	gray green.....
4	....	soluble	decomp.	soluble HF..........	rose red cryst..
5	....	....	....	....	trimetric prisms
6	....	insoluble	insoluble	insol. alk.; sol. NH_4 salts	rose red.......
7	....	$0.4^{15°}$	$1.33^{100°}$	soluble HCl, HNO_3....	....
8	....	$159^{9°}$	$420^{100°}$	v. soluble alcohol......	....
9	....	deliques.	....	....	green.........
10	....	....	....	....	red..........
11	†	$133.8^{0°}$	....	$100^{12.5°}$ alcohol.......	red monoclinic.
12	....	insoluble	....	sol. a., NH_3aq.........	reddish white..
13	....	insoluble	insoluble	sol. a., NH_3aq.; insol. al.	greenish brown.
14	....	$100^{0°}$	$115^{45°}$	sol. al. acetone.........	red needles
15	....	insoluble	insoluble	sol. H_3PO_4, NH_3aq.....	reddish........
16	....	insoluble	....	soluble H_3PO_4.........	....
17	....	....	....	....	reddish..[cryst.
18	....	decomp.	....	....	rose colored
19	....	....	....	....	yellow crystals.
20	....	insoluble	....	decomp. by HCl.......	violet........
21	dec. 880°	$26.2^{3°}$	$82.6^{100°}$	$1.04^{18°}$ methyl alcohol.	red powder....
22	$7H_2O$, 420°	$60.4^{3°}$	soluble	$2.5^{3°}$ alcohol..........	‡
23	....	0.00038	....	sol. conc. HCl., aq. r., al.	brown needles.
24	....	insoluble	....	soluble H_2SO_3...[H_2SO_4	red..........
25	....	insoluble	....	sol. KOH, HF, conc.	....
26	....	insoluble	insoluble	{s.sol.HCl,HNO_3,aq.r. / sol. hot conc. H_2SO_4..	steel gray......
27	....	....	....	....	purple red.....
28	240.5°	decomp.	....	sol. CCl_4, al. conc. HCl..	yellow needles.
29	....	....	....	sol. HF; insol. acids....	gray powder...
30	....	....	....	insol. HNO_3; sol. HF + HNO_3	black.........
31	....	decomp.	decomp.	dec. al.; sol. $H_2C_2O_4$....	monoclinic.....
32	....	....	....	..........[H_2SO_4	regular........
33	....	insoluble	....	insol. HNO_3; sol. conc.	black.........
34	....	insoluble	....	sol. conc. H_2SO_4, HF...	crystalline.....
35	....	decomp.	....	soluble conc. acids.....	yellow crystals.
36	....	decomp.	....	sol. H_2SO_4, alcohol.....	needles........
37	....	insoluble	....	sol. conc. H_2SO_4.[H_2SO_4	black.........
38	2310°	insoluble	insoluble	sol. HNO_3, hot conc.	red crystalline.
39	....	....	....	....	yellow........
40	....	....	....	soluble HCl..........	reddish brown.
41	....	....	....	decomp. by acids......	....

‡ Carmine red rhomb. or monocl. § Burns in the air. ¶ Melts at 1065° in the air.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Copper** peroxide	$CuO_2.H_2O$	113.59	....	....
2	suboxide	Cu_4O	270.28	....	oxidizes
3	**Cupric** acetate	$Cu(C_2H_3O_2)_2.H_2O$	199.63	1.9	dec. 240°
4	aceto-arsenite	$(CuOAs_2O_3)_3.Cu(C_2H_3O_2)_2$	966.12	....	....
5	ammonium chloride	$CuCl_2.2NH_4Cl.2H_2O$	277.53	1.96–1.97	$2H_2O$, 120°
6	" sulphate	$CuSO_4.4NH_3.H_2O$	245.79	....	decomp.
7	arsenate	$Cu_3(AsO_4)_2.4H_2O$	540.69	....	....
8	arsenate, acid	$Cu_5H_2(AsO_4)_4.2H_2O$	911.74	....	....
9	arsenide	Cu_5As_2	467.77	7.56	decomp.
10	arsenite (Paris green)	$CuHAsO_3$	187.54	....	decomp.
11	bromate	$Cu(BrO_3)_2.5H_2O$	409.49	2.583	$5H_2O$, 200°
12	bromide	$CuBr_2$	223.41	....	decomp.
13	carbonate basic	$CuCO_3.Cu(OH)_2$	221.16	3.7–4.0	decomp.
14	" "	$2CuCO_3.Cu(OH)_2$	344.73	3.88	decomp.
15	chlorate	$Cu(ClO_3)_2.6H_2O$	338.59	....	65°
16	chloride	$CuCl_2$	134.49	3.054	498°
17	"	$CuCl_2.2H_2O$	170.52	2.47–2.535	$2H_2O$, 100°
18	chromate, basic	$CuCrO_4.2CuO.2H_2O$	374.74	....	$2H_2O$, 260°
19	cyanide	$Cu(CN)_2$	115.59	....	easily dec.
20	dichromate	$CuCr_2O_7.2H_2O$	315.60	$2.286^{18°}$	....
21	fluoride	$CuF_2.2H_2O$	137.60	....	....
22	fluosilicate	$CuSiF_6.6H_2O$	313.97	2.182	....
23	ferricyanide	$Cu_3[Fe(CN)_6]_2$	678.11	....	....
24	ferrocyanide	$Cu_2Fe(CN)_6.7H_2O$	465.15	....	....
25	formate	$Cu(CHO_2)_2$	153.59	1.831	....
26	hydroxide	$Cu(OH)_2$	97.59	3.368	decomp.
27	iodate	$Cu(IO_3)_2$	413.41	$5.241^{15°}$	decomp.
28	"	$Cu(IO_3)_2.H_2O$	431.43	$4.876^{15°}$	dec. 290°
29	"	$Cu(IO_3)_2.2H_2O$	449.44	....	decomp.
30	" basic	$CuOHIO_3$	255.50	$4.878^{15°}$	dec. 290°
31	lactate	$Cu(C_3H_5O_3)_2.2H_2O$	277.68	....	....
32	nitro prusside	$CuFe(CN)_5NO.2H_2O$	331.50	....	....
33	nitrate	$Cu(NO_3)_2.3H_2O$	241.64	2.174	114.5°
34	"	$Cu(NO_3)_2.6H_2O$	295.69	2.074	26.4°
35	oxalate	$CuC_2O_4.\frac{1}{2}H_2O$	160.58	....	....
36	oxide	CuO	79.57	6.32–6.43	1064°
37	oxychloride	$CuCl_2.2CuO.4H_2O$	429.29	....	$3H_2O$, 140°
38	periodate	Cu_2HIO_6	351.07	....	dec. 110°

* Decomposes at 100°. † Decomposes at red heat.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	....	insoluble	....	soluble acids..........	olive green.....
2	....	insoluble	....	decomp. by acids......	olive green.....
3	....	7.2	20	7.143 alcohol; sol. ether	dark green
4	....	insoluble	....	sol. acids NH_3 aq......	green
					[bic monocl.
5	....	$33.8^{0°}$	$99.3^{80°}$	soluble alcohol........	light blue rhom-
6	....	$18.5^{21.5°}$	decomp.	insoluble alcohol.......	....
7	....	insoluble	....	soluble acids, NH_3 aq..	bluish green ...
8	....	insoluble	....	soluble acids, NH_3 aq. .	blue..........
9	....	insoluble	insoluble	soluble HNO_3, aq. r....	bluish octahed.
10	....	insoluble	....	soluble acids, NH_3 aq..	light green.....
11	....	v. soluble	....	....	blue green crys.
12	....	v. soluble	....	insoluble benzene......	iodine col. crys.
13	....	insoluble	decomp.	0.026, CO_2aq.; sol.KCN	dark gr. mo'cl.
14	....	insoluble	decomp.	sol. NH_3aq., hot $NaHCO_3$aq.	blue monoclinic
15	*	$207^{0°}$	v. soluble	soluble alcohol.....[al.	green octahedra
16	decomp.	$70.6^{0°}$	$107.9^{100°}$	$53^{15.5°}$ al.,$68^{15.5°}$ methyl	brownish yellow
17	†	$110.4^{0°}$	$192.4^{100°}$	sol. NH_4Cl, ether, al....	blue rhombic ..
18	....	insoluble	....	soluble HNO_3, NH_3aq..	yellowish brown
19	....	insoluble	....	sol. KCN.............	yellowish green.
20	....	deliques.	decomp.	sol alcohol, NH_3aq.....	black crystals..
21	....	s. soluble	decomp.	sol. al., HCl, HNO_3, HF	pale blue mono.
22	....	$2.32^{17°}$	....	$0.16^{20°}$ alcohol........	blue..........
23	....	insoluble	....	insol. HCl; sol. NH_3aq.	yellowish green.
24	....	insoluble	....	insol. acids; sol. NH_3aq.	brown red.....
25	....	12.5–25	decomp.	0.25 alcohol.....[KCN	blue monoclinic
26	....	insoluble	decomp.	sol. al., NH_4Cl., $Na_2S_2O_3$,	blue crystals...
27	....	insoluble	insoluble	sol. dil. H_2SO_4; insol. dil.	green mono-
28	....	insoluble	insoluble	HNO_3 [HNO_3	clinic plates
				sol. dil. H_2SO_4; insol. dil.	blue triclinic...
29	....	$0.33^{15°}$	$0.65^{100°}$	sol. HCl, NH_3aq.......	greenish blue ..
30	....	insoluble	insoluble	sol. dil. H_2SO_4.........	gr. orthorhomb.
31	....	16.7	$45^{100°}$	0.9 cold, 4 hot alcohol.	dark blue mono.
32	....	insoluble	....	decomp. by alkalies....	greenish.......
33	‡	137.8°	$1270^{100°}$	$100^{12.5°}$ alcohol........	blue prismatic .
34	§	$243.7^{0°}$	∞	soluble alcohol	crystalline.....
35	....	insoluble	....	insol. $H.C_2H_3O_2$.......	bluish white ...
36	O, 1110°	hygroscopic	....	sol. acids, NH_4Cl, KCN.	black monocl..
37	....	insoluble	....	soluble acids..........	blue green.....
38	100–120°	insoluble	insoluble	sol. dil. HNO_3.........	green powder..

‡ Decomposes at 170°. § Decomposes at 65°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Cupric phosphate	$Cu_3(PO_4)_2.3H_2O$	434.84	...	...
2	phosphide	Cu_3P_2	252.79	6.67	...
3	phosphite	$CuHPO_3.2H_2O$	179.65	...	decomp.
4	salicylate	$Cu(C_7H_5O_3)_2.4H_2O$	320.67	...	...
5	sulphate	$CuSO_4$	159.64	$3.516^{30°}$	dec. 621°
6	"	$CuSO_4.5H_2O$	249.72	$2.284^{15°}$	$4H_2O$,110°
7	sulphide	CuS	95.64	3.8–4.16	...
8	tartrate	$CuC_4H_4O_6.3H_2O$	265.65	...	decomp.
9	Cuprous ammonium iodide	$CuI.NH_4I.H_2O$	353.47	...	...
10	bromide	Cu_2Br_2	286.98	4.72	484°
11	carbonate	Cu_2CO_3	123.54	...	decomp.
12	chloride	Cu_2Cl_2	198.06	3.38–3.68	418°
13	cyanide	$Cu_2(CN)_2$	179.16	...	...
14	fluoride	Cu_2F_2	165.14	...	908°
15	ferricyanide	$Cu_3Fe(CN)_6$	402.61	...	...
16	ferrocyanide	$Cu_4Fe(CN)_6$	466.18	...	...
17	hydroxide	CuOH	80.58	...	$\frac{1}{2}H_2O$,360°
18	iodide	Cu_2I_2	380.98	$5.29–5.65^{15°}$	606°
19	oxide	Cu_2O	143.14	5.75–6.09	red heat
20	phosphide	Cu_6P_2	443.50	6.35–6.75	...
21	sulphide	Cu_2S	159.21	5.52–5.82	1100°
22	sulphite	$Cu_2SO_3.H_2O$	225.23	3.83–4.46	...
23	sulphocyanate	CuCNS	121.65	...	1084°
24	Cyanic acid	CNOH	43.02	1.140^{0}_{0}	...
25	Cyanogen	C_2N_2	52.02	1.8064A.	−39°
26	bromide	CNBr	105.93	3.607D.	52°
27	chloride	CNCl	61.47	2.13D.	−18°
28	"	$(CN)_3Cl_3$	184.41	1.32	145°
29	iodide	CNI	152.93	1.85	146.5°
30	sulphide	$(CN)_2S$	84.09	...	60°
31	**Dysprosium**	Dy	162.50	...	...
32	acetate	$Dy(C_2H_3O_2)_3.4H_2O$	411.632	...	dec. 120°
33	bromate	$Dy(BrO_3)_2.9H_2O$	566.484	...	78°
34	carbonate	$Dy_2(CO_3)_3.4H_2O$	577.064	...	$3H_2O$,150°
35	chloride	$DyCl_3$	268.88	$3.67^{0}_{4}{}^{\circ}$	680°
36	chromate	$Dy_2(CrO_4)_3.10H_2O$	853.16	...	$3.5H_2O$, 150°
37	oxalate	$Dy_2(C_2O_4)_3.10H_2O$	769.16	...	...
38	phosphate	$DyPO_4.5H_2O$	347.620	...	$5H_2O$,200°
39	selenate	$Dy_2(SeO_4)_3.8H_2O$	898.728	...	$8H_2O$,200°
40	**Erbium**	Er	167.4	4.77	...

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	....	soluble acids, NH_3aq...	blue green.....
2	....	insoluble	....	insol. HCl; sol. HNO_3..	black.........
3	....	insoluble	insoluble	....	........[needles
4	....	v. soluble	....	v. soluble alcohol......	bluish green
5	....	$20^{0°}$	$194^{100°}$	insoluble............	....
6	$5H_2O$, 230°	$31.6^{10°}$	$203.3^{100°}$	insoluble alcohol...[K_2S	blue triclinic...
7	....	.000033	....	sol. HNO_3, KCN; insol.	black.........
8	....	$0.02^{15°}$	$0.14^{85°}$	....	light green.....
9	....	decomp.	decomp.	soluble NH_4I.........[NH_4Cl	rhombic plates or prisms ...
10	861–954°	insoluble	....	sol. HBr, HCl, $NH_3aq.$,	....
11	....	insoluble	....	sol. acids, NH_3aq......	yellow........
12	954–1032°	insoluble	....	sol. HCl, $NH_3aq.$,NH_4Cl	tetrahedral....
13	red heat	insoluble	....	sol. HCl, $NH_3aq.$, KCN	monoclinic.....
14	....	insoluble	....	sol. HNO_3, conc. HCl.; insol. al...........	red crystalline .
15	....	insoluble	....	sol. $NH_3aq.$; insol. HCl.	brownish red ..
16	....	insoluble	....	sol.$NH_3aq.$, insol. NH_4Cl	brown red.....
17	....	insoluble	insoluble	sol. acids, NH_3aq.....	yellow........
18	759–772°	$0.0008^{18°}$	....	insol. a., al.; sol. KI....	....
19	O, 1800°	insoluble	insoluble	sol. $NH_3aq.$, NH_4Cl,HCl	carmine (red)..
20	....	insoluble	....	sol. HNO_3; insol. HCl..	gray black.....
21	....	.00005	....	soluble HNO_3.[al., ether	rhomb. or reg. .
22	....	s. soluble	....	sol. $NH_3aq.$, HCl; insol.	red...........
23	....	$0.023^{18°}$	....	sol. NH_3aq...........	....
24	....	decomp.	....	....	....
25	−22°	25 c.c.	....	4.4 c.c. al., sol. ether ..	....
26	61.3°	v. soluble	....	v. soluble alcohol......	regular........
27	15.5°	soluble	....	v. soluble al., ether....	prisms........
28	....	....	....	....	....
29	....	soluble	....	v. soluble al., ether....	needles........
30	....	v. soluble	....	v. sol. al., ether.......	rhombic tablets.
31	....	....	....	....	....
32	....	soluble	....	dif. sol. alcohol........	yellow needles
33	$6H_2O$, 110°	v. soluble	....	s. sol. alcohol.........	yel. hex. needles
34	....	insoluble	....	....	....
35	....	....	....	....	yellow plates
36	decomp.	$1.002^{25°}$	....	....	yellow crystals
37	....	insoluble	....	sol. dil. acid..........	prisms.........
38	....	insoluble	....	sol. dil. acids, acetic..	yellow.........
39	....	v. soluble	....	insol. alcohol.........	yellow needles
40	....	....	....	....	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1(A). H_2 = 1(D).	Melting Point, °C.
1	**Erbium** chloride.....	$ErCl_3.6H_2O$........	381.88	....	....
2	nitrate...........	$Er(NO_3)_3.6H_2O$.....	461.53	....	....
3	oxide............	Er_2O_3.............	382.80	8.640	infusible
4	sulphate..........	$Er_2(SO_4)_3$..........	623.00	3.678	dec. 950°
5	"	$Er_2(SO_4)_3.8H_2O$.....	767.14	3.180	....
6	**Ferric** acetate, basic	$FeOH(C_2H_3O_2)_2$.....	190.90	....	....
7	arsenate..........	$FeAsO_4.2H_2O$.......	230.85	3.18	....
8	arsenite basic.....	$2FeAsO_3.Fe_2O_3.5H_2O$	607.38	....	decomp.
9	bromide..........	$FeBr_3$.............	295.60	....	*
10	chloride..........	$FeCl_3$.............	162.22	$2.804^{10.8°}$	301°
11	"	$FeCl_3.6H_2O$........	270.32	....	37°
12	ferrocyanide (Prussian blue)	$Fe_4[Fe(CN)_6]_3$......	859.06	....	decomp.
13	fluoride..........	FeF_3..............	112.84	3.18	....
14	"	$FeF_3.4\frac{1}{2}H_2O$........	193.91	....	$3H_2O$,100°
15	formate..........	$Fe(CHO_2)_3.H_2O$....	208.88	....	....
16	hydroxide........	$Fe(OH)_3$...........	106.86	3.4–3.9	$1\frac{1}{2}H_2O$,500
17	hypophosphite....	$Fe(H_2PO_2)_3$........	251.008	....	decomp.
18	lactate...........	$Fe(C_3H_5O_2)_3$........	274.96	....	....
19	nitrate...........	$Fe(NO_3)_3.9H_2O$.....	404.01	$1.6835^{20°}$	47.2°
20	oxalate..........	$Fe_2(C_2O_4)_3$.........	375.68	....	dec. 100°
21	oxide............	Fe_2O_3.............	159.68	5.12–5.24	1548°
22	phosphate........	$FePO_4.4H_2O$.......	222.94	2.87	....
23	pyrophosphate....	$Fe_4(P_2O_7)_3.9H_2O$....	907.74	....	.....[480°
24	sulphate **	$Fe_2(SO_4)_3$..........	399.89	$3.097^{18°}$	decomp.at
25	"	$Fe_2(SO_4)_3.9H_2O$.....	562.03	2–2.1	....
26	sulphide..........	Fe_2S_3.............	207.89	4.25–4.41	decomp.
27	sulphocyanate.....	$Fe(CNS)_3.3H_2O$....	284.13	....	....
28	**Ferrous** acetate.....	$Fe(C_2H_3O_2)_2.4H_2O$..	245.95	....	decomp.
29	ammonium sulphate	$FeSO_4.(NH_4)_2SO_4.6H_2O$	392.16	1.865	....
30	arsenate..........	$Fe_3(AsO_4)_2.6H_2O$....	553.58	....	....
31	arsenite..........	$Fe_2As_2O_5$..........	341.64	....	....
32	bromide..........	$FeBr_2$.............	215.63	4.636^{25}_{4}	....
33	"	$FeBr_2.6H_2O$........	323.78	....	27°
34	carbonate.........	$FeCO_3$.............	115.84	3.70–3.87	decomp.
35	"	$FeCO_3.H_2O$........	133.86	....	decomp.
36	chloride..........	$FeCl_2$.............	126.76	$2.988^{17.9°}$	....
37	"	$FeCl_2.4H_2O$........	198.82	1.93	....
38	chloroplatinate....	$FePtCl_6.6H_2O$......	571.90	2.714	....
39	ferricyanide (Turnbull's blue)	$Fe_3[Fe(CN)_6]_2$......	591.32	....	decomp.

* Sublimes and dec.

** For ferric alum see p. 102.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	....	deliques.	soluble	soluble alcohol........	....
2	....	soluble	....	soluble alcohol........	crystals.......
3	....	insoluble	....	soluble hot acids......	....
4	....	43	....	....	....
5	....	$30^{20°}$	$100^{100°}$	....	....
6	....	insoluble	....	soluble alcohol, acids...	amorphous ....
7	....	insoluble	insoluble	soluble HCl...........	$+4H_2O$, rhomb.
8	....	decomp.	....	soluble alkalies........	brown to yellow
9	....	soluble	soluble	soluble alcohol, ether ..	dark red crystals
10	....	$74.3^{90°}$	$536.6^{100°}$	v. sol. al., ether + HCl	brown hexagon.
11	280–285°	$246.^{0°}$	∞	soluble alcohol........	....
12	....	insoluble	....	insol. al., ether; sol. conc. HCl, H_2SO_4	dark blue cryst.
13	....	s. soluble	soluble	insol. al., ether; sol. a...	green rhomb.
14	decomp.	s. soluble	soluble	insoluble alcohol......	yellow crystals.
15	....	soluble	decomp.	....	yellow crystals.
16	....	insoluble	insoluble	insoluble alcohol, ether.	reddish brown .
17	....	$0.043^{25°}$	$0.083^{100°}$	sol. sol. alk. citrate....	....
18	....	deliques.	v. soluble	insoluble ether........	brown amorph.
19	decomp.	v. soluble	v. soluble	soluble alcohol........	rhombic.......
20	....	v. soluble	....	insoluble alcohol......	amorphous ....
21	....	hygroscopic	insoluble	soluble acids..........	† [or monocl.
22	....	insoluble	0.067	insol. $H.C_2H_3O_2$........	yellow rhombic
23	....	insoluble	....	soluble acids..........	yellow........
24	....	s. soluble	decomp.	insol. conc. H_2SO_4.....	amorphous.....
25	....	v. soluble	decomp.	dec. by al.; sol. ab. al. ..	yellow rhombic
26	....	decomposes	....	decomposed by acids...	greenish yellow.
27	....	v. soluble	....	v. soluble alcohol, ether	blackish red reg.
28	....	v. soluble	....	....	needles........
29	....	$18^{0°}$	$78.2^{75°}$	insoluble alcohol......	blue green monoclinic......
30	....	insoluble	....	s. soluble NH_3aq......	....
31	....	insoluble	....	soluble NH_3aq........	greenish white.
32	....	$102^{0°}$	$177.8^{100°}$	soluble alcohol........	....
33	....	$313.2^{0°}$	∞	soluble alcohol........	yellow rhombic.
34	....	insoluble	insoluble	soluble CO_2aq........	§
35	....	s. soluble	....	soluble acids, CO_2aq....	amorphous ....
36	....	$64.4^{10°}$	$105.7^{100°}$	100 alcohol...........	....
37	....	$160.1^{10°}$	$415.5^{100°}$	soluble alcohol........	blue gr. mono..
38	....	v. soluble	v. soluble	....	yellow hexag. .
39	....	insoluble	....	insoluble al., dil. acids..	deep blue......

† Red hexag., rhombohed. or reg. § Grayish rhombohed.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1 Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Ferrous** ferrocyanide	$Fe_2Fe(CN)_6$	323.58	....	....
2	fluoride	$FeF_2.8H_2O$	237.97	4.09*	$8H_2O$,100°
3	formate	$Fe(CHO_2)_2.2H_2O$	181.89	....	decomp.
4	hydroxide	$Fe(OH)_2$	89.86	....	....
5	iodide	$FeI_2.4H_2O$	381.74	2.873	177°*
6	lactate	$Fe(C_3H_5O_3)_2.3H_2O$	287.97	....	decomp.
7	nitrate	$Fe(NO_3)_2.6H_2O$	287.96	....	60.5°
8	oxalate	$FeC_2O_4.2H_2O$	179.87	....	†
9	oxide	FeO	71.84	....	1419°
10	perchlorate	$Fe(ClO_4)_2.6H_2O$	362.86	....	dec. < 100
11	phosphate	$Fe_3(PO_4)_2.8H_2O$	501.73	2.680	....
12	potassium oxalate	$K_2Fe(C_2O_4)_2.2H_2O$	346.07	....	decomp.
13	sulphate	$FeSO_4.7H_2O$	278.02	$1.8987^{14.8^\circ}$	64° ‡
14	sulphide	FeS	87.91	4.75–5.04	1197°
15	sulphite	$FeSO_3.2\frac{1}{2}H_2O$	189.96	....	dec. 250°
16	sulphocyanate	$Fe(CNS)_2.3H_2O$	226.05	....	decomp.
17	tartrate	$FeC_4H_4O_6$	203.87	....	....
18	thiosulphate	$FeS_2O_3.5H_2O$	258.06	....	....
19	**Ferroso-ferric** chloride	$FeCl_2.2FeCl_3.18H_2O$	613.24	....	dec. 50°
20	ferricyanide (Prussian green)	$Fe'''_4Fe''_3[Fe(CN)_6]_6$	1662.27	....	dec. 180°
21	hydrate	$Fe_3O_4.4H_2O$	303.58	....	decomp.
22	oxide	Fe_3O_4	231.52	4.96–5.40	1538°
23	sulphide§	Fe_3S_4	305.80	4.51–4.64	....
24	**Fluorine**	F_2	38	1.31^{15° A. 1.14^{-187°	−223°
25	**Fluosilicic Acid**	H_2SiF_6	144.32	....	....
26	**Formic Acid**	H. COOH	46.02	1.225^{15}_{4}	8.6°
27	**Gadolinium**	Gd	157.3	1.31	....
28	acetate	$Gd.(C_2H_3O_2)_3.4H_2O$	406.44	1.611	....
29	bromide	$GdBr_3.6H_2O$	505.16	2.844	....
30	chloride	$GdCl_3$	263.68	$4.52^{0^\circ}_{4}$	628°
31	chloride	$GdCl_3.6H_2O$	371.78	2.424	....
32	nitrate	$Gd(NO_3)_3.6\frac{1}{2}H_2O$	460.43	2.332	....
33	oxalate	$Gd_2(C_2O_4)_3.10H_2O$	758.76	....	$6H_2O$,110°
34	potassium sulphate	$Gd_2(SO_4)_3.K_2SO_4.2H_2O$	813.11	1.503^{16°	....
35	selenate	$Gd_2(SeO_4)_3.8H_2O$	888.33	3.309	$8H_2O$,130°
36	sulphate	$Gd_2.(SO_4)_3$	602.78	$4.139^{14.6^\circ}$	....
37	"	$Gd_2(SO_4)_3.8H_2O$	746.94	3.010	....
38	**Gallium**	Ga	69.9	5.95^{24°	30.15°

* The anhydrous salt. † Decomposes at 160° into $2H_2O$, CO, CO_2, Fe.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	....	....	white-blue amor
2	....	s. soluble	....	insol al., ether; sol. a..	green.........
3	....	s. soluble	....	....	....
4	....	0.00067	....	soluble NH_4Cl, acids...	pale green cryst.
5	....	v. soluble	decomp.	soluble alcohol........	green crystals..
6	....	$2.1^{10°}$	$8.5^{100°}$	insoluble alcohol.....	green crystals..
7	....	$200^{0°}$	$300^{25°}$	....	crystals.......
8	....	0.022	0.026	sol. acids............	yellow crystals.
9	....	insoluble	....	sol. acids; insol. alk....	black.........
10	....	soluble	....	soluble alcohol........	green.........
11	....	insoluble	....	soluble acids..........	monoclinic.....
12	....	soluble	soluble	....	golden needles. [or rhombic
13	....	$32.8^{0°}$	$196.4^{76°}$	insoluble alcohol......	blue green mono.
14	....	0.00089	....	soluble acids..........	black hexagonal
15	....	s. soluble	....	soluble SO_2aq.........	....
16	....	v. soluble	....	v. soluble al., ether....	green rhombic..
17	....	$0.877^{15.6°}$	....	....	crystals.......
18	....	v. soluble	decomp.	v. soluble alcohol.....	green crystals..
19	....	deliques.	....	....	yellow........
20	....	insoluble	....	sol. conc. hot HCl.....	green.........
21	....	insoluble	insoluble	soluble acids..........	black.........
22	....	insoluble	insoluble	insoluble alcohol.....	black octahed..
23	....	insoluble	....	soluble acids..........	hexagonal.....
24	−187°	decomp.	decomp.	....	greenish yellow.
25	....	soluble	....	....	....
26	101°	∞	∞	....	....
27	....	....	....	....	....
28	....	s. soluble	....	....	triclinic......
29	....	soluble	soluble	....	rhombic plates.
30	....	soluble	soluble	....	prism. needles.
31	....	soluble	soluble	....	quad. pyramids
32	....	v. soluble	v. soluble	....	asymmetrical..
33	....	0.11	....	soluble conc. HNO_3....	monoclinic.....
34	....	soluble	soluble	soluble K_2SO_4.........	crystalline.....
35	....	soluble	soluble	....	pearly monocl..
36	....	$3.98^{0°}$	$2.26^{34.4°}$	....	....
37	....	soluble	soluble	....	monoclinic.....
38	....	insoluble	insoluble	soluble acids, alkalies..	gray octahed...

‡ Loses $6H_2O$ at 100°, $7H_4O$ at 300°. For other compounds see "Iron."

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water=1. Air=1 (A). H_2=1 (D).	Melting Point, °C.
1	**Gallium** bromide	$GaBr_3$	309.66	....	....
2	chloride di-	$GaCl_2$	140.82	....	164°
3	" tri-	$GaCl_3$	176.28	2.36^{80}_{80}	75.5°
4	hydroxide	$Ga(OH)_3$	120.92	....	....
5	iodide	GaI_3	451.66	....	....
6	nitrate	$Ga(NO_3)_3$	255.93	....	dec. 110°
7	oxide mon-	GaO	85.90	....	....
8	" sesqui-	Ga_2O_3	187.80	....	....
9	sulphate	$Ga_2(SO_4)_3$	428.01	....	....
10	sulphide	Ga_2S_3	236.01	....	....
11	**Germanium**	Ge	72.5	5.469^{20}_{20}	916°
12	bromide	$GeBr_4$	392.22	....	about 0°
13	chloride di-	$GeCl_2$	143.42	....	....
14	" tetra-	$GeCl_4$	214.34	$1.887^{18°}$	liquid.
15	chloroform	$GeHCl_3$	179.89	....	liquid.
16	ethide	$Ge(C_2H_5)_4$	188.66	....	....
17	fluoride	$GeF_4.3H_2O$	202.55	....	decomp.
18	iodide	GeI_4	580.18	$20.5^{440°}$	144°
19	oxide mon-	GeO	88.50	....	....
20	" di-	GeO_2	104.50	$4.703^{18°}$	....
21	oxychloride	$GeOCl_2$	159.42	....	....
22	sulphide mono-	GeS	104.57	$3.54^{1100°}$	red heat
23	" di-	GeS_2	136.64	....	....
24	**Glucinum(Beryllium)**	Gl	9.1	$1.85^{20°}$	>960°
25	bromide	$GlBr_2$	168.94	....	601°
26	carbide	Gl_2C	30.2	$1.9^{15°}$	....
27	carbonate	$GlCO_3.4H_2O$	141.16	....	....
28	" basic	$(GlO)_5.CO_2.5H_2O$	259.58	....	....
29	chloride	$GlCl_2$	80.02	....	400°....
30	"	$GlCl_2.4H_2O$	152.08	....	....
31	fluoride	GlF_2	47.1	$2.1^{15°}$	800°
32	hydroxide	$Gl(OH)_2$	43.12	....	decomp.
33	iodide	GlI_2	262.94	$4.20^{15°}$	510°
34	nitrate	$Gl(NO_3)_2.3H_2O$	187.17	....	90°
35	oxide	GlO	25.10	$3.016^{0°}$	infusible
36	oxychloride	Gl_2OCl_2	105.12	....	....
37	potassium fluoride	$GlF_2.2KF$	163.30	....	....
38	sodium fluoride	$GlF_2.2NaF$	131.10	....	....
39	sulphate	$GlSO_4.4H_2O$	177.23	$1.7125^{10.5°}$	$2H_2O$,100°
40	"	$GlSO_4.7H_2O$	231.28	....	....
41	**Gold** ¶	Au	197.2	19.32	1062°
42	colloidal	Au	197.2	....	....

* Converted into Ga_2O_3 at 200°. † Volatile at 1350°. ‡ Sublimes at 450°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	deliques.	soluble	....	crystalline.....
2	535°	deliques.	decomp.	....	crystalline.....
3	215–220°	deliques.	decomp.	....	needles........
4	....	insoluble	....	soluble acids, alkalies ..	....
5	deliques.	soluble	....	....	....
6	*	deliques.	v. soluble	....	....
7	....	insoluble	....	soluble acids..........	grayish blue...
8	....	insoluble	....	soluble acids..........	....
9	....	v. soluble	v. soluble	soluble al.; insol. ether	....
10	....	....	....	....	white..........
11	†	insoluble	insoluble	sol. hot conc.H_2SO_4,aq.r.	gray reg. oct...
12	....	decomp.	....	....	....
13	....	decomp.	....	....	....
14	86°	decomp.	....	insol. hot conc. H_2SO_4..	....
15	72°	....	....	....	....
16	160°	insoluble	....	soluble HCl...........	....
17	....	deliques.	soluble	....	crystalline.....
18	350–400°	deliques.	soluble	....	yellow........
19	....	soluble	....	soluble HCl...........	grayish black..
20	....	$0.4^{20°}$	$1.05^{100°}$	soluble acids, alkalies ..	rhombic.......
21	>100°	insoluble	....	soluble acids..........	....
22	....	0.25	soluble	soluble HCl, KOH.....	rhomb. or mon.
23	....	0.45	soluble	insol. acids; sol. alk....	....
24	....	insoluble	insoluble	sol. dil. a., alkalies.....	grayish hexag..
25	‡	deliques.	v. soluble	....	needles........
26	....	decomp.	decomp.	soluble acids..........	yellow hexag...
27	....	0.36°	....	....	....
28	....	insoluble	decomp.	soluble acids, alk......	....
29	500°	deliques.	v. soluble	v. soluble alcohol......	needles........
30	....	deliques.	v. soluble	soluble alcohol........	crystalline.....
31	....	∞ soluble	∞ soluble	soluble al., H_2SO_4......	....
32	....	insoluble	....	sol.acids,alk.,$(NH_4)_2CO_3$	....
33	585–595°	decomp.	decomp.	sol. al., ether, CS_2......	needles........
34	§	deliques.	v. soluble	v. soluble alcohol......	crystalline.....
35	....	insoluble	....	sol. acids, alk..........	hexagonal.....
36	....	insoluble	....	....	....
37	....	$2^{20°}$	$5.26^{100°}$	....	....
38	....	$1.47^{18°}$	$2.94^{100°}$	....	....
39	decomp.	$100^{14°}$	∞	insoluble alcohol......	tetragonal.....
40	....	....	....	..............[Cl_2H_2O	monoclinic.....
41	2530°......	insoluble	insoluble	insol. a.; sol. KCN, aq. r.	yellow regular.
42	....	soluble	....	insol. a.; sol. alk., aq. r..	blue violet....

§ Decom. at 100°. ¶ For other compounds of Gold see "Auric" and "Aurous."

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water=1. Air=1 (A). H_2=1 (D).	Melting Point, °C.
1	Gold phosphide	Au_2P_3	487.4	6.67	decomp.
2	Helium	He	3.99	0.1368A. 1.98D.	$<-269°$
3	Hydrazine	$NH_2.NH_2$	32.05	1.013^{15}_{15}	1.4°
4	azoimid	$N_2H_4.HN_3$	75.09	....	65°
5	dihydrochloride	$N_2H_4.H_2Cl_2$	105.00	....	198°
6	formate	$N_2H_4(H_2CO_2)_2$	124.08	....	128°
7	hydroxide	$N_2H_4.H_2O$	50.07	$1.0305^{21°}$	$<-40°$
8	sulphate	$N_2H_4.H_2SO_4$	130.14	....	254°
9	nitrate	$N_2H_4.HNO_3$	95.07	....	69°
10	Hydrazoic Acid	HN_3	43.04	....	−80°
11	Hydrobromic Acid	HBr	80.93	$2.71^{0°}$ ‡ A.	−86.13°
12	" "	$HBr.H_2O$	98.95	1.78	....
13	Hydrochloric Acid	HCl	36.47	$1.269^{0°}$ ‡ A.	−112.5°
14	Hydrocyanic Acid	HCN	27.02	$0.697^{18°}$ A.	−15°
15	Hydrofluoric Acid	HF	20.01	$0.7126^{0°}$ ‡ A.	−92.3°
16	Hydroiodic Acid	HI	127.93	4.3737A.	−51.3°
17	Hydrogen	H_2	2.016	0.06949A.	−259°
18	peroxide	H_2O_2	34.02	$1.4584^{0°}$	−2°
19	persulphide	H_2S_2	66.16	1.734	−75°
20	selenide	H_2Se	81.22	....	−64°
21	sulphide	H_2S	34.09	1.1895A.	−85.5°
22	telluride	H_2Te	129.52	65.1D.	−48°
23	Hydroxylamine	NH_2OH	33.03	1.227^{14}_{4}	33.05°
24	hydrochloride	$NH_2OH.HCl$	69.50	....	151°
25	nitrate	$NH_2OH.HNO_3$	96.05	....	−10°
26	sulphate	$(NH_2OH)_2 H_2SO_4$	164.15	....	170°
27	Indium	In	114.8	7.12^{13}_{4}	155°
28	bromide	$InBr_3$	354.60	....	....
29	chloride mono-	InCl	150.26	....	....
30	" di-	$InCl_2$	185.72	....	....
31	" tri-	$InCl_3$	221.18	....	....
32	cyanide	$In(CN)_3$	192.83	....	....
33	fluoride	$In_2F_6.18H_2O$	667.89	....	decomp.
34	hydroxide	$In(OH)_3$	165.82	....	*
35	iodide	InI_3	495.56	....	200°
36	iodate	$In(IO_3)_3$	639.56	....	....
37	nitrate	$In(NO_3)_3.4\frac{1}{2}H_2O$	381.90	....	$4\frac{1}{2}H_2O$,10°
38	oxide mon-	InO	130.80	....	....
39	" sesqui-	In_2O_3	277.60	7.179	infusible
40	perchlorate	$In(ClO_4)_3.8H_2O$	557.31	....	80°......

* Sublimes at white heat. ‡ Values found by experiment.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (Al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	...	...	...	insol. HCl; dec. by HNO_3	gray...
2	$-268.5°$	1.487 c.c.$^{0.5}$	1.371 c.c.^{25}	absorbed by platinum..	...
3	113.5°	v. soluble	...	soluble alcohol...	crystalline...
4	...	deliques.	v. soluble	v. soluble alcohol...	...
5	...	soluble	v. soluble	soluble alcohol...	regular...
6	...	soluble	...	...	regular...
7	119°	∞	v. soluble	∞ sol. al.; insol. ether..	...
8	...	s. soluble	v. soluble	insoluble alcohol...	tables...
9	...	...	...	...	...
10	37°	∞	...	soluble alcohol...	liquid...
11	$-68.7°$	221.2$^{0°}$	130$^{100°}$	soluble alcohol...	crystalline...
12	...	...	...	...	...
13	$-83.1°$	82.5$^{10°}$	56.1$^{60°}$	soluble alcohol, ether ..	...
14	26.1°	∞	...	∞ sol. al., ether...	crystalline...
15	19.44°	264	...	...	...
16	34.1°	42500 c.c.$^{10°}$	...	soluble alcohol...	...
17	$-252.5°$ [(47mm.)	2.1 c.c.$^{0.5°}$	...	sol. palladium, charcoal, Pt., Fe., etc.	...
18	80.2°	∞	...	sol. ether, al...	prisms...
19	...	decomposes	...	sol.CS_2, benz.; insol. al..	yellowish oil. ..
20	$-42°$	331 c.c.$^{13°}$	...	soluble CS_2...	...
21	$-61.8°$	437 c.c.$^{0°}$	186 c.c.$^{40°}$	9.54$^{20°}$ vol. al...	...
22	0	soluble	...	...	...
23	70 (60mm.)	soluble	decomp.	soluble alcohol, acids...	crystalline...
24	decomp.	v. soluble	...	sol. al.; insol. ether...	monoclinic...
25	dec.$>$100°	v. soluble	decomp.	v. soluble alcohol...	...
26	...	v. soluble	soluble	s. soluble alcohol...	monoclinic...
27	700°	insoluble	insoluble	soluble acids...	regular octahed.
28	...	deliques.	v. soluble	...	crystalline...
29	...	deliques.	decomp.	...	dark red cryst. .
30	...	deliques.	decomp.	...	crystalline...
31	440°	deliques.	v. soluble	s. sol. al., ether...	...
32	...	insoluble	...	sol. HCN... [ether	...
33	...	s. soluble	decomp.	sol.HCl,HNO_3; insol. al.,	needles...
34	...	insoluble	...	sol. acids, alk.; insol.	...
35	...	deliques.	...	... [NH_3	yellow crystals.
36	decomp.	0.067$^{20°}$	...	sol. dil. H_2SO_4, HNO_3 ..	crystalline...
37	decomp.	deliques.	soluble	soluble alcohol...	needles...
38		insoluble	...	soluble acids...	black...
39	† [200°	insoluble	...	sol. acids, insol. NH_3...	yel. amor. rh'bh.
40	decomp. at	soluble	decomp.	sol. ab. al., ether...	crystalline...

† Volatile at 850°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Indium** sulphate	$In_2(SO_4)_3$	517.81	3.438	....
2	sulphide	In_2S_3	325.81	....	infusible
3	sulphite	$2In_2O_3.3SO_2.8H_2O$	891.54	....	$3H_2O$,100°
4	**Iodic Acid**	HIO_3	175.93	$4.629^{0°}$	110°
5	**Iodine**	I_2	253.84	$4.948^{17°}$	114.2°
6	chloride mono- α	ICl	162.38	3.1822^{0}_{4}	24.7°
7	" " β	ICl	162.38	....	13.9
8	" tri-	ICl_3	233.30	3.1107	33°
9	fluoride	IF_5	221.92	3.5	8°
10	monobromide	IBr	206.84	....	36°
11	oxide di-	IO_2	158.92	$4.2^{10°}_{10}$	dec. 130°
12	" pent-	I_2O_5	333.84	$4.799^{25°}_{4}$	dec. 300°
13	**Iridium**	Ir	193.1	15.86	2250°
14	"	Ir	193.1	22.42	1950°
15	bromide tri-	$IrBr_3.4H_2O$	504.92	....	$3H_2O$,100-120°
16	" tetra-	$IrBr_4$	512.78	....	decomp.
17	chloride di-	$IrCl_2$	264.02	....	....
18	" tri-	$IrCl_3$	299.48	....	....
19	" tetra-	$IrCl_4$	334.94	....	decomp.
20	hydroxide di-	$IrO_2.2H_2O$	261.13	....	....
21	" sesqui-	$Ir_2O_3.3H_2O$	488.25	....	....
22	iodide tri-	IrI_3	573.86	....	....
23	" tetra-	IrI_4	700.78	....	dec. 360°
24	oxide di-	IrO_2	225.10	....	....
25	" sesqui-	Ir_2O_3	431.20	....	0,400°
26	sulphide mono-	IrS	225.17	....	oxidizes
27	" di-	IrS_2	257.24	....	oxidizes
28	" sesqui-	Ir_2S_3	482.43	....	oxidizes
29	**Iron** pure	Fe	55.84	7.85–7.88	1505°
30	wrought	Fe	55.84	7.86	1600°
31	white pig	Fe	55.84	7.58–7.73	1075°
32	gray pig	Fe	55.84	7.03–7.13	1275°
33	steel	Fe	55.84	7.60–7.80	1375°
34	cast steel	Fe	55.84	....	1375°
35	boride	FeB	66.84	$7.15^{18°}$	....
36	carbide	Fe_3C	179.52	$7.07^{16°}$	....
37	"	FeC_4	103.84	....	....

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	...	deliques.	v. soluble	...	...
2	...	...	...	dec. by a.; sol. $(NH_4)_2S$	yellow
3		insoluble	...	soluble acids	crystalline
4	$\frac{1}{2}H_2O$,110°	$286^{0°}$	$471^{80°}$	v. soluble alcohol, HNO_3	trimetric
5	184 35°	$0.0182^{11°}$	$0.092^{55°}$	sol. KI, CS_2, al., $CHCl_3$, ether	gray black rhombic
6	101.3°	decomp.	...	sol. al., CS_2, ether,	dark red needles
7	101.3°	decomp.	...	glacial $H.C_2H_3O_2$	reddish brown rhomb. plates
8	...	soluble	decomp.	sol. al., ether, HCl, glac. $H.C_2H_3O_2$	yellow crystals.
9	97°	decomp.	decomp.	decomposes acids	liquid
10	...	s. soluble	...	sol. al., CS_2, ether	dark gray cryst.
11		insoluble	decomp.	insol. al. ether; sol. H_2SO_4	yellow crystals.
12	...	$187.4^{13°}$	...	insol. al., CS_2, ether	trimetric
13	...	insoluble	insoluble	sol. aq. r., $Cl_2.H_2O$	white spongy
14	...	insoluble	insoluble	insol. a., aqua regia	reg. or hexagon. rhombohedral
15	...	soluble	...	insoluble alcohol, ether.	olive gr. cryst
16	...	soluble	...	soluble alcohol	blue crystals
17	...	insoluble	...	...	blackish green
18	...	soluble	...	insoluble acids, alkalies.	olive green
19	...	soluble	decomp.	soluble alcohol, dil. HCl	dark red crystals
20	...	insoluble	...	soluble HCl, alk.	indigo blue
21	...	insoluble	...	insoluble acids	black
22	...	s. soluble	soluble	insoluble alcohol	black crystals
23	...	insoluble	insoluble	soluble KI, NaI	black
24	...	insoluble	...	insoluble acids, alk.	black
25	...	insoluble	...	insoluble acids, alk.	blue black
26	...	insoluble	...	insol. acids; sol. K_2S	blue black
27	...	insoluble	...	insol. acids; sol. K_2S	black
28	...	s. soluble	...	soluble HNO_3, K_2S	brown black
29	2450°	insoluble	insoluble	sol. acids; insol. alk.	cubical or reg. octahedral
30	...	insoluble	insoluble	sol. acids; insol. alk.	...
31	...	insoluble	insoluble	sol. acids; insol. alk.	...
32	...	insoluble	insoluble	sol. acids; insol. alk.	...
33	...	insoluble	insoluble	sol. acids; insol. alk.	...
34	...	insoluble	insoluble	sol. acids; insol. alk.	...
35	...	insoluble	...	sol. HNO_3, hot conc. H_2SO_4	gray crystals
36	...	insoluble	insoluble	soluble acids	regular
37	...	insoluble	...	s. soluble HCl	gray crystals

* Loses $8H_2O$ at 260°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Iron* carbonyl	$Fe(CO)_5$	195.84	1.47	−21°
2	disulphide	FeS_2	120.01	4.86–5.18	1171°
3	nitride	Fe_2N	125.69	6.35	dec. 200°
4	phosphide	Fe_2P	142.72	$6.57^{15°}$	1290°
5	Krypton	Kr	82.92	2.818A. 40.78D.	−169°
6	Lactic Acid	$H.C_3H_5O_3$	90.05	1.2485^{15}_{4}	< −24°
7	Lanthanum	La	139.0	6.1545	810°
8	bromate	$La_2(BrO_3)_6.18H_2O$	1369.808	....	37.5°
9	bromide	$LaBr_3.7H_2O$	504.87	....	....
10	carbide	LaC_2	163.00	$5.02^{20°}$	....
11	carbonate	$La_2(CO_3)_3.8H_2O$	602.13	....	....
12	chloride	$LaCl_3$	245.32	3.947^{18}_{4}	890°
13	"	$LaCl_3.7H_2O$	371.43	....	....
14	nitrate	$La(NO_3)_3.6H_2O$	433.13	....	40°
15	oxalate	$La_2(C_2O_4)_3.9H_2O$	704.14	....	....
16	oxide sesqui-	La_2O_3	326.00	$6.41^{15°}$	infusible
17	sulphate	$La_2(SO_4)_3$	566.15	3.600	dec. 1150°
18	"	$La_2(SO_4)_3.9H_2O$	728.29	2.821	decomp.
19	sulphide	La_2S_3	374.15	$4.911^{11°}$	stable at 1000°
20	Lead	Pb	207.1	11.34	327°
21	acetate (sugar of)	$Pb(C_2H_3O_2)_2.3H_2O$	379.20	2.50	75°, $3H_2O$
22	" basic	$Pb_2(C_2H_3O_2)_3OH$	608.28	....	....
23	" "	$Pb(C_2H_3O_2)_2$ $Pb(OH)_2.H_2O$	584.28	....	....
24	" "	$Pb(C_2H_3O_2)_2.2Pb$ $(OH)_2$	807.38	....	....
25	azoimide	PbN_6	291.16	....	....
26	borate	$Pb(BO_2)_2.H_2O$	311.12	5.598(anhy)	red heat
27	bromate	$Pb(BrO_3)_2.H_2O$	480.96	....	dec. 180°
28	bromide	$PbBr_2$	366.94	$6.572^{19.2°}$	370°
29	carbonate	$PbCO_3$	267.10	6.43	....
30	" basic	$2PbCO_3.Pb(OH)_2$	775.31	....	decomp.
31	chlorate	$Pb(ClO_3)_2.H_2O$	392.04	4.037	dec. 230°
32	chloride	$PbCl_2$	277.02	5.80	498°
33	" tetra-	$PbCl_4$	348.94	$3.18^{0°}$	−15°
34	chlorite	$Pb(ClO_2)_2$	342.02	....	....
35	chromate	$PbCrO_4$	323.10	$6.123^{15°}$	fusible
36	" basic (chrome red)	$PbCrO_4.PbO$	546.20	....	....

* For other compounds of Iron see "Ferrous" and "Ferric."

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	103°	...	...	sol.conc. H_2SO_4, al., alk....	yellow ..[rhomb.
2	decomp.	.00049	...	insoluble dil. acids	yellow reg. or
3	...	decomp.	...	sol. HCl, H_2SO_4....[+HF	...
4	...	insoluble	insoluble	insol. acids; sol. HNO_3	gray crystals ..
5	−151.7	...	...	...	...
6	...	∞	∞	∞ sol. al.; s. sol. ether ..	...
7	...	decomp.	decomp.	soluble acids ...	lead gray ...
8	$14H_2O$, 100°	$416^{25°}$	...	insol. alcohol ...	hexag. prisms ..
9	...	v. soluble	...	v. sol. al.; insol. ether ..	...
10	...	decomp.	decomp.	soluble acids ...	yellow crystals
11	...	insoluble	...	s. soluble, CO_2 aq ...	trimetric ...
12	...	v. soluble	decomp.	v. soluble alcohol ...	white crystals .
13	...	v. soluble	...	v. soluble alcohol ...	triclinic ...
14	126	deliques.	v. soluble	v. soluble alcohol ...	prismatic ...
15	...	$.00008^{25°}$	...	...	...
16	...	s. soluble	...	soluble al., acids, NH_4Cl	rhombic ...
17	...	$3.0^{0°}$	$0.87^{100°}$	s. soluble alcohol ...	...
18	...	$3.8^{0°}$	$1.06^{100°}$	s. soluble alcohol ...	hexagonal ...
19	...	insoluble	decomp.	soluble dilute acids ...	red-yellow crys.
20	1525°	insoluble	insoluble	sol HNO_3, hot conc. H_2SO_4	regular or monoclinic
21	280	$45.64^{15°}$	$200^{100°}$	insoluble alcohol ...	monoclinic ...
22	...	v. soluble	...	s. soluble alcohol ...	...
23	...	v. soluble	...	v. soluble alcohol ...	needles ...
24	...	5.55	18.2	soluble alcohol ...	needles ...
25	...	0.05	s. soluble	v. soluble $H.C_2H_3O_2$ ...	crystalline ...
26	†	insoluble	insoluble	insol. alk., sol. acids ...	crystalline ...
27	...	$1.38^{20°}$	...	...	monoclinic ...
28	861	$0.455^{0°}$	$4.75^{100°}$	sol. acids, KBr; insol. al.	rhombic ...
29	...	0.00198	decomp.	insoluble alcohol ...	rhombic ...
30	...	insoluble	insoluble	0.02 CO_2 aq ...	amorphous ...
31	...	$171^{18°}$	soluble	soluble ...	monoclinic ...
32	861–954	$0.673^{0°}$	$3.34^{100°}$	0.09 dil. HCl, insol. al ..	rhombic ...
33	‡	decomp.	decomp.	...	...
34	...	s. soluble	soluble	...[$H.C_2H_3O_2$.	yellow monocl..
35	...	$.00002^{18°}$	insoluble	sol. acids, alk.; insol.	yellow monocl..
36	...	insoluble	insoluble	soluble acids, alkalies ..	red crystals ...

† Loses H_2O at 160°.

‡ Decomposes at 105°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Lead** cyanate	$Pb(CNO)_2$	291.12		decomp.
2	cyanide	$Pb(CN)_2$	259.12		
3	dichromate	$PbCr_2O_7$	423.10		
4	dithionate	$PbS_2O_6.4H_2O$	439.30	3.245	decomp.
5	ferricyanide	$Pb_3[Fe(CN)_6]_2.6H_2O$	1333.27		decomp.
6	ferrocyanide	$Pb_2Fe(CN)_6.3H_2O$	680.15		decomp.
7	fluoride	PbF_2	245.10	8.24	fusible
8	formate	$Pb(CHO_2)_2$	297.12	4.571	dec. 190°
9	hydroxide	$2PbO.H_2O$	484.22		dec. 145°
10	"	$3PbO.H_2O$	687.32	7.592	H_2O, 130°
11	iodate	$Pb(IO_3)_2$	556.94		
12	iodide	PbI_2	460.94	6.12	358°
13	nitrate	$Pb(NO_3)_2$	331.12	$4.53^{24°}$	*
14	oxalate	PbC_2O_4	294.9	5.025	dec. 300°
15	oxide mon-	PbO	223.10	9.375	888°
16	" "	PbO	223.10	$8.74^{14°}$	
17	" "	PbO	223.10	9.2–9.5	red heat
18	" sub-	Pb_2O	430.20	8.342	
19	" sesqui-	Pb_2O_3	462.20		dec. 370°
20	" red (minium)	Pb_3O_4	685.30	$9.096^{15°}$	dec. 500°-530°
21	" per-	PbO_2	239.10	8.91	decomp.
22	oxychloride	$PbCl_2.PbO$	501.12	7.21	
23	"	$PbCl_2.2PbO$	724.22	7–7.1	
24	"	$PbCl_2.3PbO$	947.32		
25	" (cossel yellow)	$PbCl_2.7PbO$	1839.7		
26	perchlorate	$Pb(ClO_4)_2.3H_2O$	460.07		
27	periodate	$PbHIO_5$	415.03		dec. 130°
28	"	$PbHIO_5.H_2O$	433.04		†
29	persulphate	$PbS_2O_8.3H_2O$	453.29		
30	phosphate	$Pb_3(PO_4)_2$	811.38	6.9–7.3	
31	phosphite	$PbHPO_3$	287.15		decomp.
32	pyrophosphate	$Pb_2P_2O_7.H_2O$	606.30		806°(anh.)
33	selenide	$PbSe$	286.30	$8.10^{15°}$	1065°
34	sulphate	$PbSO_4$	303.17	6.23	1100°
35	" acid	$Pb(HSO_4)_2.H_2O$	419.27		
36	" basic	$PbSO_4.PbO$	526.27		
37	sulphide	PbS	239.17	7.13–7.7	1015°
38	sulphite	$PbSO_3$	287.17		

* Decomposes at 205°–223°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	s. soluble	....	crystals.......
2	....	s. soluble	soluble	insoluble KCN	....
3	....	decomp.	....	soluble acids, alkalies ..	red crystalline .
4	....	soluble	....	....	crystalline.....
5	....	s. soluble	soluble	soluble alkalies, HNO_3 .	red crystals....
6	....	insoluble	....	s. soluble conc., H_2SO_4 .	....
7	....	$0.064^{18°}$	....	soluble HNO_3.........	....
8	....	$1.6^{16°}$	$18^{100°}$	insoluble alcohol......	rhombic.......
9	....	s. soluble	s. soluble	soluble alkalies........	....
10	....	0.014	....	soluble alkalies........	regular........
11	....	$0.0012^{2°}$	....	s. soluble HNO_3.......	....
12	861–954°	$0.044^{0°}$	$0.436^{100°}$	insol. al., sol. KI......	yellow hexag...
13	....	$39^{0°}$	$138.9^{100°}$	$8.77^{22°}$ alcohol........	octahedral.....
14	....	$0.00016^{18°}$	....	insol. al. sol. HNO_3....	....
15	white heat	$0.013–02^{20°}$	....	soluble alkalies, lead..	yellow rhomb..
16	white heat	$0.0013^{22°}$	insoluble	acetate, NH_4Cl, $CaCl_2$,	red hexagonal..
17	white heat	insoluble	insoluble	$SrCl_2$..............	amorphous ....
18	....	insoluble	....	dec. by acids, alkalies..	grayish black..
19	....	insoluble	decomp.	decomp...............	reddish yellow
20	....	insoluble	....	sol. glacial $H.C_2H_3O_2$... [$C_2H_3O_2$	scarlet. [amorp.
21	....	insoluble	insoluble	insol. al.; sol. glac. H.	brown hexag...
22	....	insoluble	insoluble	soluble alkalies........	tetragonal.....
23	....	insoluble	....	soluble alkalies........	yellow trimet...
24	....	$0.0056^{18°}$	$0.07^{74°}$	....	yellow.........
25	....	insoluble	....	....	yellow crystals.
26	....	100°	....	soluble alcohol........	....
27	....	insoluble	insoluble	soluble dil. HNO_3......	crystalline.....
28	....	insoluble	insoluble	s. soluble dil. HNO_3....	amorphous ....
29	....	v. soluble	....	....	....
30	....	$0.000014^{20°}$	insoluble	sol. HNO_3; insol. H. $C_2H_3O_2$	....
31	....	insoluble	....	soluble HNO_3.........	....
32	....	insoluble	decomp.	sol. $Na_4P_2O_7$, HNO_3, KOH	rhombic.......
33	....	insoluble	....	decomp. HNO_3........	regular........
34	....	$0.0042^{20°}$	s. soluble	sol. conc. H_2SO_4, HCl, NH_4 salts; insol. al.	rhombic.......
35	....	s. soluble	....	s. soluble H_2SO_4......	crystalline.....
36	....	0.0044°	s. soluble	s. soluble H_2SO_4.......	....
37	1085°	0.0001	insoluble	sol. conc.; a. insol. KOH	black regular ..
38	....	insoluble	....	s. sol., H_2SO_3 sol. HNO_3	....

† Loses H_2O at 110°–120°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Lead** sulphochloride	$3PbS.PbCl_2$	995.53	…	…
2	sulphocyanate	$Pb(CNS)_2$	323.26	3.82	…
3	thiosulphate	PbS_2O_3	319.24	…	decomp.
4	tungstate	$PbWO_4$	455.10	8.235	…
5	**Lithium**	Li	6.94	$0.534^{20°}$	186°
6	acetate	$LiC_2H_3O_2.2H_2O$	102.00	…	70°
7	amid	$LiNH_2$	22.97	$1.178^{17.5°}$	374°
8	benzoate	$LiC_7H_5O_2$	127.980	…	…
9	bicarbonate	$LiHCO_3$	67.95	…	…
10	bichromate	$Li_2Cr_2O_7.2H_2O$	266.01	…	…
11	borate	$Li_2B_4O_7.5H_2O$	259.96	…	…
12	bromide	LiBr	86.86	3.466^{25}_{4}	442°–547°
13	carbide	Li_2C_2	37.88	$1.65^{18°}$	…
14	carbonate	Li_2CO_3	73.88	2.111	618°–710°
15	chlorate	$LiClO_3.\frac{1}{2}H_2O$	99.41	…	50°
16	chloride	LiCl	42.40	1.998–2.074	602°
17	chloroplatinate	$Li_2PtCl_6.6H_2O$	529.97	…	$6H_2O$,180°
18	chromate	$Li_2CrO_4.H_2O$	147.90	…	…
19	citrate	$Li_3C_6H_5O_7.4H_2O$	281.804	…	decomp.
20	fluoride	LiF	25.94	2.601	801°
21	fluosilicate	$Li_2SiF_6.2H_2O$	192.21	2.33	$2H_2O$,100°
22	formate	$LiCHO_2.H_2O$	69.96	1.435–1.479	decomp.
23	hydroxide	LiOH	23.95	…	red heat
24	iodide	LiI	133.86	4.063^{25}_{4}	330°–446°
25	"	$LiI.3H_2O$	287.91	…	72°
26	nitrate	$LiNO_3$	69.01	2.334–2.442	253°–264°
27	"	$LiNO_3.3H_2O$	123.00	…	29.88°
28	oxalate	$Li_2C_2O_4$	101.88	$2.1213^{17.5°}$	decomp.
29	" acid	$LiHC_2O_4.H_2O$	113.96	…	decomp.
30	oxide	Li_2O	29.88	$2.102^{15°}$	sublimes
31	perchlorate	$LiClO_4$	106.40	1.841	236°
32	"	$LiClO_4.3H_2O$	160.45	…	95°
33	phosphate	$Li_3PO_4.H_2O$	133.90	$2.41^{15°}$	857°
34	salicylate	$LiC_7H_5O_3$	143.940	…	decomp.
35	silicate	Li_2SiO_3	90.18	$2.529^{15°}$	1180°
36	silicide	$Li\ Si_2$	98.54	1.12	decomp.
37	sulphate	Li_2SO_4	109.95	$2.210^{15°}$	818°–853°
38	"	$Li_2SO_4.H_2O$	127.97	2.052^{20}_{4}	H_2O, 130°
39	" acid	$LiHSO_4$	104.02	2.123	120°
40	sulphide	Li_2S	45.95	1.63–1.7	…
41	sulphite	$Li_2SO_3.6H_2O$	202.05	…	red heat
42	urate	$LiHC_5H_2N_4O_3$	174.00	…	…

* Decomposes at 600°. † Loses $1\frac{1}{2}$ H_2O at 90°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	...	insoluble	decomp.	insoluble dilute acids...	red...
2	...	$0.5^{20°}$	decomp.	sol. KCNS, HNO_3...	yellow monocl..
3	...	0.03	...	soluble $Na_2S_2O_3$...	...
4	...	insoluble	...	...	regular...
5	>1400°	decomp.	decomp.	soluble acids...	silvery...
6	decomp.	$300^{15°}$	v. soluble	21.5 alcohol...	rhombic...
7	430°	decomp.	decomp.	...	regular...
8	...	$33^{25°}$	$40^{100°}$	$7.7^{25°}$, $10^{78°}$ al...	crystals...
9	...	$5.5^{13°}$	...	...	...
10	...	$168.3^{30°}$	...	...	blk. brown crys
11	...	v. soluble	...	insoluble alcohol...	...
12	...	$143^{0°}$	$270^{103°}$	...	crystalline...
13	...	decomp.	decomp.	soluble acids...	crystalline...
14	*	$1.539^{0°}$	$0.728^{100°}$	insoluble alcohol...	prisms...
15	†	$301^{18°}$	∞	v. soluble alcohol...	tetragonal...
16	...	$63.7^{0°}$	$129^{96°}$	$2.475^{25°}$ al., sol. ether..	octahedral...
17	...	soluble	soluble	soluble alcohol, ether..	orange red hex..
18	...	$132^{30°}$	...	...	red trimetric...
19	...	$50^{25°}$	$66.7^{100°}$	s. sol. al. ether...	crystals...
20	...	$0.27^{18°}$	...	soluble HF...	tablets...
21	decomp.	52.6	...	sol. alcohol; insol. ether	monoclinic...
22	...	$61.67^{0°}$	$346.6^{104°}$	...	rhombic...
23	...	$12.7^{0°}$	$17.5^{100°}$	s. soluble alcohol...	crystalline...
24	...	$151^{0°}$	$476^{99°}$	...	crystalline...
25	...	...	...	...	rh'mb. or hex.
26	...	$48.3^{0°}$	$227.3^{100°}$	soluble alcohol...	rhombohedral
27	...	$138.4^{0°}$	∞	...	or regular...
28	...	$8^{19.5°}$	...	...	...
29	...	$8^{17°}$	...	...	...
30	...	$5.22^{0°}$	$6.26^{100°}$	...	crystalline...
31	...	soluble	...	soluble alcohol...	...
32	‡	soluble	...	soluble alcohol...	rhombohedral..
33	§	0.04	...	soluble acids, NH_4Cl..	rhomboidal...
34	...	v. sol.	...	v. sol. al...	...
35	...	insoluble	s. decomp.	soluble dil. HCl....[tine	hexagonal...
36	...	decomp.	decomp.	dec. by a.; insol. turpen-	blue crystals..
37	...	$35.34^{0°}$	$29.24^{100°}$	insol. 80% al...	¶
38	...	$43.52^{0°}$	$35.75^{100°}$	insol. 80% al...	monoclinic...
39	...	decomp.	...	...	prismatic...
40	...	v. soluble	...	v. soluble alcohol...	...
41	...	soluble	...	s. soluble alcohol...	needles...
42	...	$0.27^{20°}$	$2.5^{100°}$	...	...

‡ Loses $2H_2O$ at 100°, $3H_2O$ at 150°. § Loses H_2O at 100°.

¶ Monoclinic, regular, rhombic or hexagonal.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Magnesium**	Mg	24.32	1.69–1.75	650°
2	acetate	$Mg(C_2H_3O_2)_2.4H_2O$	214.43	1.45	....
3	aluminate	$MgO.Al_2O_3$	142.52	$3.57^{15°}$	....
4	ammonium arsenate	$MgNH_4AsO_4.6H_2O$	289.42	....	decomp.
5	" chloride	$MgCl_2.NH_4Cl.6H_2O$	256.84	1.456	....
6	" chromate	$MgCrO_4.(NH_4)_2CrO_4.6H_2O$	400.50	$1.8293^{17°}$	....
7	" phosphate	$MgNH_4PO_4.6H_2O$	245.56	$1.71^{15°}$	decomp.
8	" sulphate	$MgSO_4.(NH_4)_2SO_4.6H_2O$	360.64	$1.723^{\frac{20}{4}}$	....
9	arsenate	$2MgHAsO_4.13H_2O$	562.78	$3.155^{15°}$	....
10	arsenite	$Mg_3(AsO_3)_2$	318.88	....	....
11	benzoate	$Mg(C_7H_5O_2)_2.3H_2O$	320.45	....	decomp.
12	borate	$Mg(BO_2)_2.8H_2O$	254.45	2.27	....
13	bromate	$Mg(BrO_3)_2.6H_2O$	388.26	2.29	$6H_2O$, 200°
14	bromide	$MgBr_2$	184.16	....	695°
15	"	$MgBr_2.6H_2O$	292.26	....	decomp.
16	carbonate	$MgCO_3$	84.32	3.04	dec. 350°
17	"	$MgCO_3.3H_2O$	138.37	$1.808^{\frac{18}{18}}$	....
18	" basic	$4MgCO_3.Mg(OH)_2.5H_2O$	485.70	2.18	....
19	" "	$3MgCO_3.Mg(OH)_2 3H_2O$	365.34	2.18	....
20	chlorate	$Mg(ClO_3)_2.6H_2O$	299.34	....	40°
21	chloride	$MgCl_2$	95.24	2.177	708°
22	"	$MgCl_2.6H_2O$	203.34	$1.569^{17°}$	$2H_2O$, 100°
23	chromate	$MgCrO_4.7H_2O$	266.43	1.761	....
24	ferrocyanide	$Mg_2Fe(CN)_6.12H_2O$	476.73	....	....
25	fluoride	MgF_2	62.18	2.472	1396°
26	formate	$Mg(CHO_2)_2.2H_2O$	150.37	....	....
27	hydroxide	$Mg(OH)_2$	58.34	$2.36^{15°}$	decomp.
28	iodate	$Mg(IO_3)_2.4H_2O$	446.22	3.28	$4H_2O$, 210°
29	iodide	MgI_2	278.16	....	decomp.
30	nitrate	$Mg(NO_3)_2.6H_2O$	256.50	1.464	90°
31	nitride	Mg_3N_2	100.98	....	decomp.
32	oxalate	$MgC_2O_4.2H_2O$	148.35	....	decomp.
33	oxide	MgO	40.32	3.22–3.654	1890–1940°
34	permanganate	$Mg(MnO_4)_2.6H_2O$	370.28	....	decomp.
35	phosphate	$Mg_3(PO_4)_2.4H_2O$	335.10	$1.640^{15°}$ ($22H_2O$)	....

* Loses $5H_2O$ at 330°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	1120°	insoluble	s. decomp.	sol. a., NH_4 salts......	....
2	....	deliques.	v. soluble	v. soluble alcohol......	monoclinic.....
3	....	....	....	....	....
4	....	$0.038^{20°}$	soluble	0.003 Mg. mix., insol. al.	tetragonal.....
5	....	16.7	....	....	....
6	....	v. soluble	v. soluble	....	yellow monocl..
7	....	0.01322	....	soluble acids; insol. al..	tetragonal.....
8	....	$13.49^{0°}$	$67.87^{75°}$	....	monocl. prisms
9	....	insoluble	0.15	sol. HNO_3; insol. NH_4Cl	....
10	....	insoluble	....	insol. NH_3aq.; sol. NH_4Cl	....
11	....	$4.5^{25°}$	soluble	....	....
12	....	insoluble	insoluble	soluble acids..........	....
13	decomp.	$71.5^{7°}$	v soluble	....	regular........
14	....	$91.9^{0°}$	$120.2^{100°}$	....	....
15	....	$316^{0°}$	....	soluble alcohol........	....
16	....	0.0106	....	sol. acids, 2.21 CO_2aq..	hex. rhomboh. or rhombic
17	....	$0.1518^{19°}$	decomp.	sol. acids, 1.40 CO_2aq..	hexagonal.....
18	....	0.04	0.011	soluble acids, NH_4 salts	....
19	....	0.04	0.011	soluble acids, NH_4 salts	monoclinic.....
20	....	deliques.	v. soluble	soluble alcohol........	....
21	red heat	$52.2^{0°}$	$65.87^{80°}$	50 alcohol............	hexagonal.....
22	decomp.	167	367	50 alcohol............	monoclinic.....
23	....	$211.5^{18°}$	v. soluble	....	yellow........
24	....	33	....	....	pale yel. cryst..
25	....	$0.0087^{18°}$	insoluble	sol. HNO_3; insol. al....	tetragonal.....
26	....	7.7	....	insol. alcohol, ether....	rhombic.......
27	....	0.0009	....	soluble NH_4 salts......	rhombohedral..
28	decomp.	$10^{15°}$	$33^{100°}$	....	monoclinic.....
29	....	$100^{0°}$	$164.9^{110°}$	soluble alcohol, ether..	.......[triclinic
30	*	200	∞	soluble alcohol........	monoclinic or
31	....	insoluble	....	soluble acids; insol. al...	†
32	....	$0.07^{16°}$	$0.08^{100°}$	sol. alk. oxalates, a.....	....
33	....	0.00062	....	sol. acids, NH_4 salts...	reg. or hexag...
34	....	v. soluble	decomp.	sol. glac. $H.C_2H_3O_2$ methyl alcohol	purple needles .
35	....	0.0205	....	sol. acids, insol. NH_4 salts, $H.C_2H_3O_2$	monoclinic.....

† Greenish yellow crystals.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Magnesium				
1	phosphate acid....	$MgHPO_4.3H_2O$.....	174.42	$2.123^{15°}$	....
2	" " ...	$Mg_3(PO_4)_2.8H_2O$....	407.17	$2.195^{15°}$	....
3	" " ...	$MgHPO_4.7H_2O$.....	246.48	....	....
4	" pyro-...	$Mg_2P_2O_7$..........	222.72	2.40	....
5	phosphite.........	$MgHPO_3.3H_2O$.....	158.42	....	....
6	potassium chloride	$MgCl_2.KCl.6H_2O$....	277.90	....	....
7	" sulphate	$MgSO_4.K_2SO_4.6H_2O$.	402.76	2.0277^{20}_{4}	....
8	selenate..........	$MgSeO_4.6H_2O$......	275.62	1.928	....
9	silicide...........	Mg_5Si_3............	206.50	....	....
10	sodium chloride...	$MgCl_2.NaCl.H_2O$....	171.77	....	....
11	sulphate..........	$MgSO_4$............	120.39	2.65	....
12	"	$MgSO_4.7H_2O$.......	246.50	$1.6784^{17.5°}$	....
13	sulphide..........	MgS..............	56.39	$2.82^{15°}$	decomp.
14	sulphite..........	$MgSO_3.6H_2O$.......	212.49	....	$6H_2O$,200°
15	tartrate..........	$MgC_4H_4O_6.4H_2O$....	244.42	1.67	decomp.
16	thiosulphate......	$MgS_2O_3.6H_2O$......	248.56	$1.818^{24°}$	$3H_2O$,170°
17	**Manganese**.........	Mn..............	54.93	7.42	1225°
18	acetate...........	$Mn(C_2H_3O_2)_2.4H_2O$..	245.04	1.6	....
19	ammon. phosphate.	$NH_4MnPO_4.H_2O$....	186.03	....	....
20	" sulphate..	$MnSO_4.(NH_4)_2SO_4.6H_2O$	391.25	1.837^{18}_{4}	....
21	arsenite..........	$Mn_3H_6(AsO_3)_4.2H_2O$.	698.71	....	....
22	benzoate.........	$Mn(C_7H_5O_2)_2.3H_2O$..	517.06	....	....
23	boride............	MnB_2.............	76.93	$6.04^{19°}$	fusible
24	bromide..........	$MnBr_2$............	214.77	....	decomp.
25	"	$MnBr_2.4H_2O$.......	286.83	....	....
26	carbide...........	Mn_3C.............	176.79	$6.89^{17°}$	....
27	carbonate........	$MnCO_3$............	114.93	3.125–3.66	decomp.
28	chloride..........	$MnCl_2$............	125.85	2.478	650°
29	"	$MnCl_2.4H_2O$........	197.91	1.913	87.5°
30	" per-......	$MnCl_4$.............	196.77	....	....
31	ferrocyanide......	$Mn_2Fe(CN)_6.7H_2O$..	447.87	....	....
32	fluoride di-........	MnF_2.............	92.93	3.98	856°
33	" sesqui-....	$Mn_2F_6.6H_2O$........	331.96	3.54	decomp.
34	fluosilicate........	$MnSiF_6.6H_2O$......	305.33	$1.9038^{17.5°}$	decomp.
35	formate..........	$Mn(CHO_2)_2.2H_2O$...	180.98	1.953	decomp.
36	hydroxide -ous....	$Mn(OH)_2$..........	88.95	3.258	decomp.
37	" -ic	$Mn_2O_3.H_2O$........	175.88	4.335	decomp.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	....	....	....	....	plates........
2	....	....	....	....	monocl. plates
3	....	0.3	0.2	soluble acids; insol. al..	hexagonal....
4	....	insoluble	insoluble	soluble acids; insol. al..	....
5	....	0.25	....	soluble acids..........	....
6	....	....	....	....	hexagonal....
7	....	$19.26^{0°}$	$81.70^{75°}$	....	monocl. prisms
8	....	v. soluble	....	....	monoclinic....
9	....	insoluble	decomp.	dec. by acids, NH_4Cl...	....
10	....	soluble	....	....	....
11	....	$26.9^{0°}$	$73.8^{100°}$	soluble alcohol........	....
12	....	$76.9^{0°}$	$671.2^{100°}$	soluble alcohol........	tetragonal or monoclinic.
13	....	decomp.	....	decomposed by acids...	red brown cub.
14	decomp.	1.25	0.83	insoluble alcohol.......	....
15	....	$0.8^{16°}$	....	....	monoclinic
16	decomp.	v. soluble	v. soluble	soluble alcohol........	prismatic.....
17	1900°	decomp.	decomp.	soluble dil., acids......	reddish..[clinic
18	....	3	....	soluble alcohol........	pale red mono-
19	....	0.0031	0.05	insol. alcohol, NH_4 salts..	....
20	....	$51.3^{25°}$	v. soluble	....	....
21	....	insoluble	....	soluble acids..........	rose red......
22	....	$6.55^{15°}$	....	....	flat prisms...
23	....	insoluble	decomp.	soluble acids..........	gray. vio. crys.
24	....	$127.3^{0°}$	$228^{100°}$	....	rose red......
25	....	$296.7^{0°}$	....	....	red monoclinic
26	....	decomp.	decomp.	soluble acids..........	tetrahedral...
27	....	0.013	insoluble	0.028, CO_2aq., sol. dil. a.	rose col. rhom-
28	....	$62.16^{10°}$	$123.8^{106.3°}$	sol. alcohol; insol. ether	[bohedral
29	106°	$151^{8°}$	∞	sol. alcohol; insol. ether	rose col. mono.
30	....	soluble	soluble	soluble ether..........	green........
31	....	insoluble	....	sol. HCl; insol. NH_4 salts	...... [prisms
32	....	insoluble	decomp.	insol. al., ether; sol. a..	red quadratic
33	....	v. soluble	decomp.	soluble acids..........	crystalline....
34	....	140	v. soluble	soluble alcohol........	hexagonal....
35	....	soluble	soluble	....	monoclinic....
36	....	insoluble	insoluble	sol. a., NH_4 salts; insol. alk.	hexagonal....
37	....	insoluble	insoluble	sol. hot conc., H_2SO_4	tetragonal....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Manganese				
1	hypophosphite	$Mn(H_2PO_2)_2.H_2O$ ..	203.06	....	....
2	iodide..........	$MnI_2.4H_2O$	380.83	....	decomp.
3	lactate..........	$Mn(C_3H_5O_3)_2.3H_2O$.	287.06	....	decomp.
4	nitrate..........	$Mn(NO_3)_2.6H_2O$ ...	287.05	1.82	25.8°
5	oxalate..........	$MnC_2O_4.2\frac{1}{2}H_2O$	187.97	$2.453^{20°}$	dec. 150°
6	oxide -ous........	MnO..........	70.93	5.09–5.18	white heat
7	" -ic.........	Mn_2O_3..........	157.86	4.325–4.82	$\frac{1}{3}$O, 1090°
8	" di-.........	MnO_2..........	86.93	5.026	$\frac{1}{2}$O, 570°
9	" tri-.........	MnO_3..........	102.93	....	decomp.
10	" hept-.......	Mn_2O_7..........	221.86	>1.84	< −20°
11	phosphate -ous.....	$Mn_3(PO_4)_2.7H_2O$ ...	480.98	....	....
12	" " acid .	$MnHPO_4.3H_2O$....	205.04	....	....
13	phosphite.........	$MnHPO_3.H_2O$.....	153.00	....	H_2O,200°
14	pyrophosphate.....	$Mn_2P_2O_7$.........	283.94	$3.5847^{20°}$	....
15	"	$Mn_2P_2O_7.3H_2O$....	337.98	....	....
16	silicate..........	$MnSiO_3$.........	131.23	3.350	1218°
17	silicide..........	MnSi..........	83.23	$5.90^{15°}$	....
18	" di-.........	$MnSi_2$..........	111.53	$5.24^{13°}$	....
19	" -ous........	Mn_2Si..........	138.16	$6.20^{15°}$	....
20	sulphate -ic.......	$Mn_2(SO_4)_3$........	398.07	....	decomp.
21	" -ous.....	$MnSO_4$..........	151.00	2.954	700°
22	" "	$MnSO_4.H_2O$.......	169.02	$2.845^{15°}$	....
23	" "	$MnSO_4.2H_2O$......	187.03	$2.526^{15°}$	....
24	" "	$MnSO_4.3H_2O$......	205.05	$2.356^{15°}$	....
25	" "	$MnSO_4.4H_2O$ *	223.06	2.107	....
26	" "	$MnSO_4.5H_2O$......	241.08	$2.1006^{14.5°}$	54°
27	" "	$MnSO_4.6H_2O$......	259.10	....	....
28	" "	$MnSO_4.7H_2O$......	277.11	2.092	$7H_2O$, 280°
29	sulphide -ic.......	MnS_2..........	119.07	.463	decomp.
30	" -ous.....	MnS..........	87.00	$3.63^{17°}_{17}$	decomp.
31	" "	MnS..........	87.00	$3.55^{17°}_{17}$	decomp.
32	" "	$3MnS.H_2O$........	279.02	....	decomp.
33	sulphocyanate......	$Mn(CNS)_2.3H_2O$...	225.14	....	¶
34	**Manganocyanhydric** acid	$H_4Mn(CN)_6$.......	215.02	....	decomp.
35	**Manganomanganic** oxide	Mn_3O_4..........	228.79	4.33–4.9	infusible
36	**Mercuriammonium di-** ammonium bromide.	$NHg_2Br.NH_4Br$...	593.09	....	decomp.

* The ordinary salt. ¶ Loses $3H_2O$ at 160°–170°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	....	....	....	rose red cryst.
2	....	deliques.	v. soluble	....	rose red mono.
3	....	soluble	v. soluble	....	amethyst mon.
4	129.4°	$426.4^{0°}$	....∞....	v. soluble alcohol......	....
5	....	0.05	$0.08^{100°}$	sol. dil. acids..........	....
6	....	insoluble	insoluble	soluble acids, NH_4Cl...	grass green reg.
7	....	insoluble	insoluble	soluble acids..........	black regular.
8	....	insoluble	insoluble	soluble HCl...........	‡
9	....	soluble	decomp.	sol. conc., H_2SO_4......	reddish.......
10	explodes	v. soluble	decomp.	soluble conc. H_2SO_4 ...	dark red oil...
11	....	s. soluble	....	soluble acids; insol. al..	amorphous ...
12	....	s. soluble	decomp.	soluble acids; insol. al..	crystalline....
13	....	s. soluble	....	sol. $MnCl_2.MnSO_4$	reddish.......
14	....	insoluble	....	soluble acids..........	....
15	....	insoluble	....	soluble $Mn_4P_2O_7$.......	......[needles
16	....	insoluble	....	....	rose colored
17	....	insoluble	insoluble	insoluble acids........	tetrahedral...
18	....	insoluble	insoluble	insol. $HNO_3.H_2SO_4$ sol. HF, alk.	gray octahedra
19	....	insoluble	insoluble	sol. HCl, NaOH; insol. HNO_3	quadr. prisms.
20	160°	deliques.	decomp.	sol. conc.,HCl, dil.H_2SO_4	green crystals.
21	....	$53.2^{0°}$	$67^{75°}$	sol. al.; insol. ether....	....
22	†57° & 117°	$98.47^{48°}$	$79.77^{100°}$	....	....
23	†40° & 57°	$85.27^{35°}$	$106.8^{55°}$	....	....
24	†30° & 40°	$74.22^{5°}$	$99.31^{57°}$	....	....
25	†18° & 30°	$105.3^{0°}$	$111.2^{54°}$	insoluble alcohol......	monoclinic or
26	†8° & 18°	$124.4^{0°}$	$142.1^{54°}$	....	[rhombic
27	†−5° & +8°	$147.4^{0°}$	$134.5^{38°}$	....	...[or rhombic
28	†−10°&−5°	$172^{0°}$	$118^{15°}$	....	pale red mono.
29	....	insoluble	insoluble	decomp. by HCl.......	black regular..
30	....	0.00047	insoluble	insol.$(NH_4)_2S$; sol.dil. a.	green cryst...
31	....	0.0006	insoluble	insol.$(NH_4)_2S$; sol. dil. a.	red } pink....
32	....	0.0006	insoluble	insol$(NH_4)_2S$; sol. dil. a.	gray } pink....
33	....	deliques.	v. soluble	v. soluble alcohol......	....
34	....	insoluble	....	insol. ether; v. sol. al...	....
35	....	insoluble	insoluble	soluble hot HCl.......	brown tetrag..
36	....	decomp.	decomp.	soluble HCl, KI.... ..	yellow.......

† Stable between the temperatures given. ‡ Black tetragonal or rhombic.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Mercuri diammonium chloride				
1	infusible white ppt.	$NHg_2Cl.NH_4Cl$	504.17	5.700	volatile
2	fusible white ppt.	$NHg_2Cl.3NH_4Cl$	611.18	...	300°
3	ammonium iodide	$NHg_2I.3NH_4I$	764.92	...	...
4	" nitrate	$NHg_2NO_3.NH_4NO_3.H_2O$	375.29	...	...
5	" sulphate	$(NHg_2)_2SO_4.3(NH_4)_2SO_4.4H_2O$	1202.9	...	...
6	bromide	NHg_2Br	495.13	...	decomp.
7	chloride	NHg_2Cl	450.67	...	dec. 300°
8	hydroxide	NHg_2OH	232.22	...	explodes
9	iodide	NHg_2I	341.13	...	...
10	mercuric chloride	$2NHg_2Cl.HgCl_2$	1172.3	...	dec. 360°
11	nitrate	NHg_2NO_3	277.22	...	...
12	sulphate	$(NHg_2)_2SO_4.2H_2O$	960.12	...	...
	Mercuri diammonium				
13	bromide	$NH_2HgBr.NH_4Br$	394.51	...	dec. 180°
14	cupric iodide	$(NH_3)_4.HgI_2.CuI_2$	839.99	...	...
15	mercuric chloride	$(NH_3)_2HgCl_2.HgCl_2$	577.11	...	...
16	sulphate	$(NH_3)_2HgSO_4.H_2O$	348.75	...	H_2O, 115°
	Mercuro ammonium				
17	chloride	NH_3HgCl	253.09	...	decomp.
18	diammonium acetate	$(NH_3)_2Hg(C_2H_3O_2)_2.H_2O$	370.73	...	decomp.
	Mercuroxy				
19	ammonium chloride	NH_2Hg_2OCl	468.69	...	dec. 200°
20	" hydrox.	NH_2Hg_2OOH	450.23	...	dec. 130°
21	" iodide	NH_2Hg_2OI	559.15	...	>128°
22	" nitrate	$NH_2Hg_2ONO_3$	495.24	...	...
23	" sulphate	$(NH_2Hg_2O)_2SO_4$	962.52	...	decomp.
24	Mercuric acetate	$Hg(C_2H_3O_2)_2$	318.65	$3.2544^{22°}$	...
25	arsenate	$Hg_3(AsO_4)_2$	879.72	...	...
26	bromate	$Hg(BrO_3)_2.2H_2O$	492.47	...	*
27	bromide	$HgBr_2$	360.44	5.74	235°
28	carbonate basic	$2HgO.HgCO_3$	694.40	...	...
29	chlorate	$Hg(ClO_3)_2$	367.52	4.998	decomp.
30	chloride	$HgCl_2$	271.52	5.32–5.46	265°
31	chromate	$HgCrO_4$	316.60	...	decomp.
32	cyanide	$Hg(CN)_2$	252.62	4.018	decomp.
33	fluoride	HgF_2	238.60	...	...

* Decomposes at 130°–140°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	0.14	decomp.	insol. alcohol; sol. acids.	....
2	....	insoluble	decomp.	soluble acids, KI.......	red crystals....
3	....	decomp.	....	soluble alcohol, ether..	....
4	....	insoluble	....	sol. HNO_3; insol. KOH.	....
5	....	decomp.	....	sol. dil. a., NH_4 salts...	....
6	....	insoluble	....	soluble HCl, KI.......	yellow........
7	....	insoluble	insoluble	soluble acids, KI......	yellow........
8	....	decomp.	....	sol. hot, HCl, HNO_3...	brown........
9	....	insoluble	....	sol. HCl; dec. by KI...	....
10	....	insoluble	insoluble	soluble hot HCl.......	red crystals....
11	....	insoluble	....	soluble KI...........	....
12	....	insoluble	....	soluble HCl, KI.......	....
13	....	insoluble	....	soluble HCl, H_2SO_4....	rhombohedral..
14	....	decomp.	....	sol. alcohol+ $H.C_2H_3O_2$.	....
15	....	insoluble	decomp.	....	....
16	decomp.	decomp.	decomp.	sol. acids, NH_4 salts....	orthorhombic..
17	....	insoluble	....	....	black.........
18	....	v. soluble	....	s. soluble alcohol......	rectangular plates.......
19	....	s. soluble	....	soluble HCl, HNO_3....	yellow..[rhomb.
20	....	$0.007^{17°}$	$0.06^{80°}$	....	yellow brown
21	explodes	....	....	soluble HCl, KI.......	brown........
22	....	insoluble	....	....	....
23	....	s. soluble	....	soluble HCl, HNO_3....	white and yel..
24	....	$25^{10°}$	$100^{100°}$	soluble alcohol........	micaceous scales
25	....	s. soluble	....	sol. HCl, HNO_3........	....
26	....	$0.17°$	1.6	sol. HNO_3, HCl, $Hg(NO_3)_2$	crystalline.....
27	†	$1.06^{9°}$	$20–25^{100°}$	soluble alcohol, ether..	rhombic.......
28	....	insoluble	....	....	brown red.....
29	....	25°	....	....	needles........
30	303°–307°	$5.73^{0°}$	$53.96^{100°}$	43.5 al., 33 ether.....	rhombic.......
31	....	s. soluble	decomp.	decomposed by acids...	dark red trim...
32	....	$12.5^{15°}$	$53^{100°}$	5 alcohol............	tetragonal.....
33	....	decomp.	....	....	crystalline.....

† Sublimes at 319°–325°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Mercuric** fluosilicate	$HgSiF_6HgO.3H_2O$	613.55	....	....
2	fulminate	$HgC_2N_2O_2$	284.62	4.42	explodes
3	hydrate	$Hg(OH)_2$	234.62	....	H_2O, 175°
4	iodate	$Hg(IO_3)_2$	550.44	....	....
5	iodide red	HgI_2	454.44	6.2–6.32	241°–257°
6	" yellow	HgI_2	454.44	5.91–6.06	241°
7	iodo bromide	$HgIBr$	407.44	....	229°
8	" chloride	$HgICl$	362.98	....	153°
9	nitrate	$Hg(NO_3)_2.2H_2O$	342.64	....	decomp.
10	nitride	Hg_3N_2	629.82	....	explodes
11	oxalate	HgC_2O_4	288.60	....	decomp.
12	oxide	HgO	216.60	11.00–11.29	decomp.
13	oxybromide	$HgBr_2.3HgO$	1010.2	....	....
14	oxychloride	$HgCl_2.3HgO$	921.32	8.670	....
15	oxycyanide	$Hg(CN)_2.HgO$	469.22	$4.437^{19°}$	explodes
16	oxyfluoride	$HgF_2.HgO.H_2O$	473.22	....	dec. 100°
17	oxyiodide	$HgI_2.3HgO$	1104.2	....	....
18	phosphate	$Hg_3(PO_4)_2$	791.88	....	....
19	potassium iodide	$2HgI_2.2KI.3H_2O$	1295.1	$4.289^{23.5°}$	....
20	selenide	$HgSe$	279.80	7.1–8.877	sublimes
21	sulphate	$HgSO_4$	296.67	6.466	dec.red ht.
22	" basic	$HgSO_4.2HgO$	729.87	6.44	....
23	sulphide	HgS	232.67	7.55–7.70	sublimes at 446°
24	"	HgS	232.67	8.06–8.12	
25	sulphocyanate	$Hg(CNS)_2$	316.76	....	decomp.
26	**Mercurous** acetate	$Hg_2(C_2H_3O_2)_2$	519.25	....	decomp.
27	arsenate acid	Hg_2HAsO_4	541.17	....	decomp.
28	"	Hg_3AsO_4	740.76	....	decomp.
29	bromate	$Hg_2(BrO_3)_2$	657.04	....	decomp...
30	bromide	$HgBr$	280.52	7.307	....
31	carbonate	Hg_2CO_3	461.20	....	dec. 130°
32	chlorate	$HgClO_3$	284.06	6.409	decomp.
33	chloride	$HgCl$	236.06	6.993–7.18	sublimes at 400°–500°
34	"	$HgCl$	236.06	6.482	
35	chromate	Hg_2CrO_4	517.20	....	decomp.
36	fluoride	HgF	219.60	....	dec. 200°

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	....	decomp.	....	soluble acids..........	yellow needles
2	....	s. soluble	soluble	sol. alcohol, NH_3......	octahedral....
3	....	insoluble	....	soluble acids....[HNO_3	....
4	....	insoluble	....	sol. NH_4Cl, HCl; insol.	....
5	349°	$0.004^{17.5°}$	....	$1.186^{18°}$ alcohol; sol.	red tetragonal.
6	349°	insoluble	....	$Na_2S_2O_3$, alk. salts	yellow rhomb.
7	360°	....	....	soluble ether..........	yellow rhomb.
8	315°	insoluble	s. soluble	soluble alcohol........	yel. rhomb. or red tetrag.
9	....	v. soluble	decomp.	sol. HNO_3, insol. alcohol	crystalline....
10	....	decomp.	....	decomp. by acids......	brown powder
11	....	insoluble	insoluble	sol. HCl; s. sol. HNO_3..	yellow tetrag. plates or red moncl. prisms
12	....	$0.00515^{25°}$	$0.0395^{100°}$	insoluble alcohol; sol. a.	
13	....	insoluble	s. soluble	v. soluble alcohol......	yellow crystals
14	....	insoluble	decomp.	....	yellow prisms
15	....	s. soluble	....	....	needles.......
16	....	decomp.	....	soluble HNO_3.........	yellow crystals
17	....	decomp.	....	soluble HI............	yellow brown
18	....	insoluble	s. soluble	sol. a., NH_4Cl.; insol. al.	....
19	....	decomp.	....	soluble alcohol, ether, KI	....
20	....	insoluble	....	soluble aqua regia.....	gray laminal..
21	....	decomp.	....	soluble a., insol. al.....	....
22	....	0.002	....	soluble a., insol. al.....	yellow.......
23	....	0.0025	....	sol. Na_2S; insol. HNO_3.	black amorph.
24	....	insoluble	insoluble	soluble aqua regia.....	rhomboh. or red hexag.
25	....	s. soluble	soluble	sol. alcohol, NH_4 salts..	.......[scales
26	....	$0.75^{13°}$	....	sol. H_2SO_4,HNO_3......	micaceous
27	....	insoluble	....	soluble HNO_3.........	yellow to red.
28	....	insoluble	....	soluble HNO_3; insoluble $H.C_2H_3O_2$	dark red.....
29	....	decomp.	....	sol. HNO_3, HCl, $HgNO_3$	crystalline....
30	340°–405°	insoluble	insoluble	sol. acids; insol. al.....	yellow tetrag..
31	....	insoluble	decomp.	soluble NH_4Cl.........	black or yellow
32	....	soluble	decomp.	sol. al.,$HC_2H_3O_2$.......	columnar crys.
33	382.5°	0.00031	0.01	insol. al., ether; sol. $Hg(NO_3)_2$, aq. r.	rhombic......
34	....	0.00031	0.01	s. sol. hot., HNO_3, HCl	tetragonal....
35	....	s. soluble	soluble	soluble HNO_3, KCN...	red crystals...
36	....	decomp.	....	....	yellow monocl.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Mercurous** fluosilicate	$Hg_2SiF_6.2H_2O$	579.53	....	....
2	formate	$HgCHO_2$	245.61	....	decomp.
3	iodate	$HgIO_3$	375.49	....	decomp.
4	iodide	HgI	327.52	7.70	290°
5	nitrate	$HgNO_3.2H_2O$	298.64	4.78	decomp.
6	oxalate	$Hg_2C_2O_4$	489.20	....	....
7	oxide	Hg_2O	417.20	8.95–10.69	decomp.
8	phosphate	Hg_3PO_4	681.20	....	....
9	sulphate	Hg_2SO_4	497.27	$7.064^{25°}_{4}$	melts....
10	sulphide	Hg_2S	433.27	....	dec. at 0°
11	sulphocyanate	HgCNS	258.68	....	decomp.
12	trinitride	HgN_3	242.63	....	explodes
13	**Mercury**	Hg	200.6	13.5953^{0}_{4}	−38.85°
14	**Molybdenum**	Mo	96.0	8.6–9.01	2500°
15	bromhydroxide	$Mo_3Br_4(OH)_2$	641.70	....	....
16	bromide di-	$MoBr_2$	255.84	....	....
17	" tri-	$MoBr_3$	335.76	....	*
18	" tetra-	$MoBr_4$	415.68	....	decomp.
19	carbide	MoC	108.00	$8.4^{20°}$	decomp.
20	chloride di-	$MoCl_2$	166.92	....	decomp.
21	" tri-	$MoCl_3$	202.38	....	decomp.
22	" tetra-	$MoCl_4$	237.84	....	....
23	" penta-	$MoCl_5$	273.30	$9.5^{350°}$	194°
24	chlorohydroxide	$Mo_3Cl_4(OH)_2.2H_2O$	499.89	....	....
25	hexafluoride	MoF_6	210.0	....	17°
26	oxide di-	MoO_2	128.00	$6.44^{10°}$	....
27	" sesqui-	Mo_2O_3	240.00	....	....
28	" tri-	MoO_3	144.00	$4.39^{21°}$	759°
29	oxybromide	MoO_2Br_2	287.84	....	sublimes
30	oxychloride	$MoOCl_4$	253.84	....	<100°
31	"	MoO_2Cl_2	198.92	....	sublimes
32	"	$MoOCl_3$	218.38	....	sublimes
33	"	$Mo_2O_3Cl_5$	417.30	....	sublimes
34	phosphide	Mo_3P_2	350.08	6.17	oxidizes
35	sulphide di-	MoS_2	160.14	$4.80^{14°}$	oxidizes
36	" "	MoS_2 (Mineral)	160.14	4.44–4.80	....
37	" tri-	MoS_3	192.21	....	loses S

* Decomposes at red heat.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	....	s. soluble	....	....	prismatic cryst.
2	....	$0.4^{17°}$	decomp.	insol. alcohol	glistening scales
3	....	insoluble	insoluble	soluble dil. HCl........	yellowish......
4	310°	0.0417	....	sol. KI; insol. alcohol..	yellow tetrag...
5	....	v. soluble	decomp.	....	monoclinic.....
6	....	insoluble	insoluble	s. sol. HNO_3..........	....
7	....	insoluble	insoluble	sol. glac.,$HC_2H_3O_2$ insol. alk.	black.........
8	....	insoluble	decomp.	soluble HNO_3.........	....
9	decomp.	$0.055^{16.5°}$	$0.092^{100°}$	soluble H_2SO_4, HNO_3...	monoclinic ....
10	....	insoluble	....	insol. acids, $(NH_4)_2S$...	black.........
11	....	insoluble	....	soluble HCl, KCNS.....	....
12	....	insoluble	....	....	crystalline.....
13	357.33°	insoluble	insoluble	sol. HNO_3, conc. H_2SO_4; insol. HCl	silvery octahed.
14	....	insoluble	insoluble	sol. HNO_3, conc. H_2SO_4 aq. r., HCl	gray.........
15	....	....	....	soluble KOH.........	red powder....
16	....	insoluble	insoluble	soluble alk., insol. a....	yellow........
17	....	insoluble	insoluble	insol. a., dec. by alk...	dark green need.
18	volatile	v. soluble	....	.... [H_2SO_4	black needles ..
19	....	insoluble	insoluble	sol. HNO_3, HF, hot conc.	gray prisms....
20	....	insoluble	insoluble	sol. acids, al., ether....	yellow amorph.
21	....	insoluble	decomp.	sol. HNO_3, H_2SO_4, al...	red needles....
22	....	deliques.	decomp.	sol. HNO_3, H_2SO_4, al...	brown crystals.
23	268°	deliques.	decomp.	soluble HNO_3, H_2SO_4, al.	black crystals..
24	....	insoluble	....	soluble acids; insol. al..	yellow amorph.
25	35°	s. soluble	....	....	crystalline.....
26	....	insoluble	....	s. sol.,conc. H_2SO_4, insol. KOH	red prisms.....
27	....	insoluble	....	insoluble acids, alkalies	black to yellow
28	sublimes	$0.107^{18°}$	$1.705^{70°}$	soluble acids, NH_3aq...	rhombic.......
29	....	soluble	....	....	yellow crystals.
30	‡	soluble	decomp.	....	green.........
31	....	soluble	....	soluble alcohol.......	yellow to white.
32	....	deliques.	....	soluble acids..........	green.........
33	....	deliques.	soluble	....	dk. brown crys.
34	....	insoluble	....	soluble hot, HNO_3.....	gray crystals...
35	....	insoluble	....	sol. H_2SO_4, aqua regia..	black powder ..
36	....	insoluble	....	....	....
37	....	s. soluble	soluble	sol. alk., sulphides.....	red brown.....

‡ Sublimes below 100°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Molybdenum				
1	" tetra-.....	MoS_4	224.28	....	oxidizes
2	**Molybdic Acid**......	H_2MoO_4	162.02	....	....
3	"	$H_2MoO_4.H_2O$	180.03	$3.124^{15°}$	H_2O, 70°
4	**Neodymium**........	Nd	144.3	6.9563	840°
5	bromate..........	$Nd_2(BrO_3)_6.18H_2O$	1380.408	....	66.7°
6	carbide..........	NdC_2	168.3	5.15	decomp.
7	chloride..........	$NdCl_3$	250.68	$4.134^{25°}_{4}$	124°
8	chloride..........	$NdCl_3.6H_2O$	358.78	$2.282\frac{16.5}{4}$	124°
9	oxide..........	Nd_2O_3	336.6	....	....
10	sulphide..........	Nd_2S_3	384.81	$5.179^{11°}$	decomp.
11	**Neon**..........	Ne	20.2	0.674 A. 9.96 D.	−253°
12	**Nickel**..........	Ni	58.68	8.6–8.93	1450°
13	acetate..........	$Ni(C_2H_3O_2)_2$	176.73	1.799	decomp.
14	ammon. chloride ..	$NiCl_2.NH_4Cl.6H_2O$	291.24	1.645	....
15	" sulphate..	$NiSO_4.(NH_4)_2SO_4.6H_2O$	395.00	$1.929^{20°}_{4}$	....
16	arsenide..........	NiAs	133.64	7.663	....
17	arsenite..........	$Ni_3H_6(AsO_3)_4.H_2O$	691.44	....	decomp.
18	boride..........	NiB	69.67	$7.39^{18°}$	....
19	bromate..........	$Ni(BrO_3)_2.6H_2O$	422.62	2.575	decomp.
20	bromide..........	$NiBr_2$	218.52	4.64^{28}_{28}	decomp.
21	"	$NiBr_2.3H_2O$	272.57	....	$3H_2O$,200°
22	" ammonia .	$NiBr_2.6NH_3$	320.66	1.837	....
23	carbonate..........	$NiCO_3$	118.68	....	decomp.
24	" basic....	$2NiCO_3.3Ni(OH)_2 4H_2O$	587.51	....	decomp.
25	carbonyl..........	$Ni(CO)_4$	170.68	$1.3185^{17°}$	−25°
26	chloride..........	$NiCl_2$	129.60	2.56	sublimes
27	chloride..........	$NiCl_2.6H_2O$	237.70	....	....
28	" ammonia	$NiCl_2.6NH_3$	231.74	....	....
29	cyanide..........	$Ni(CN)_2.4H_2O$	110.72	....	$4H_2O$,200°
30	ferrocyanide......	$Ni_2Fe(CN)_6.11H_2O$	527.44	....	....
31	fluoride..........	NiF_2	96.68	$2.855^{14°}$	....
32	" acid.....	$NiF_2.5HF.6H_2O$	304.82	2.132	....
33	fluosilicate........	$NiSiF_6.6H_2O$	309.08	2.109	†
34	formate..........	$Ni(CHO_2)_2.2H_2O$	184.73	2.1547	decomp.
35	hydroxide -ous....	$4Ni(OH)_2.H_2O$	388.80	4.36	decomp.

* Loses $5H_2O$ at 105°, $6H_2O$ at 160°. † Decomposes at red heat.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	....	soluble alk., sulphide . .	brown powder. .
2	....	s. soluble	....	soluble NH_3aq	needles. . . . .
3	....	$0.133^{18°}$	$2.13^{70°}$	sol. acids, NH_3 aq., NH_4 salts	yellow monocl. .
4	....	decomp.	....	....	yellowish. . . . . .
5	$18H_2O$, 150°	$146^{25°}$	....	....	red hex. prisms
6	....	decomp.	decomp.	sol. dil. a., conc. H_2SO_4	yellow hexag . . .
7	....	$99^{13°}$	$141.2^{100°}$	insol. ether, $CHCl_3$ sol. al.	violet prisms . . .
8	*	$246^{13°}$	$511.6^{100°}$	soluble alcohol	red rhombic . . .
9	....	insoluble	....	soluble HCl.	reddish. . . . .
10	....	insoluble	decomp.	soluble dil. acids	olive green . . . .
11	−243	....	....	....	....
12	....	insoluble	insoluble	sol. dil. HNO_3 ; s. sol. HCl, H_2SO_4	....
13	....	16.6	....	insoluble alcohol	apple gr. prisms
14	....	v. soluble	....	....	green rhombic .
15	....	$2.5^{3.5°}$	$39.2^{85°}$	s. sol. $(NH_4)_2SO_4$ aq	green crystals . .
16	....	insoluble	insoluble	soluble aqua regia	....
17	....	insoluble	....	soluble alkalies, acids . .	greenish white .
18	....	decomp.	decomp.	soluble HNO_3	prisms . .[octah.
19	....	28	....	....	monometric
20	....	$112.8^{0°}$	$155.1^{100°}$	soluble alcohol, ether . .	yellow scales . . .
21	....	$199^{0°}$	$315.7^{100°}$	sol. al., ether, NH_3aq. . .	green needles. .
22	....	v. soluble	decomp.	....	violet powder. .
23	....	insoluble	insoluble	insoluble acids	greenish rhomb.
24	....	insoluble	decomp.	soluble acids, NH_4 salts	green . . . .
25	43°	$0.018^{9.8°}$	insoluble	sol. al., CH_3Cl, conc. HNO_3	needles. . . . .
26	....	$53.8^{0°}$	$87.6^{100°}$	sol. alcohol, NH_3aq	yellow scales. . .
27	....	$179.3^{0°}$	$599^{100°}$	v. soluble alcohol	green hexagonal
28	....	soluble	decomp.	insol. al.; sol. NH_3aq . .	....
29	decomp.	insoluble	insoluble	sol. KCN; insol. dil. KCl	apple green pl. .
30	....	insoluble	....	insol. HCl; sol. NH_3 aq .	greenish white. .
31	....	0.02	....	insol. a., al., ether	green quadratic
32	....	....	....	....	trimetric prisms
33	....	v. soluble	....	....	green rhomboh.
34	....	soluble	....	....	green crystals. .
35	....	insoluble	....	sol. a., NH_3aq. insol. alk.	pale green . . . . .

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Nickel** hydroxide -ic	$Ni(OH)_3$	109.70	....	decomp.
2	iodide	NiI_2	312.52	....	sublimes
3	" ammonia	$NiI_2.6NH_3$	414.66	2.101	decomp.
4	nitrate	$Ni(NO_3)_2.6H_2O$	290.80	$2.065^{14°}$	56.7°
5	" ammonia	$Ni(NO_3)_2.4NH_3.2H_2O$	286.83	....	....
6	oxide mon-	NiO	74.68	6.6–6.8	* †
7	" sesqui-	Ni_2O_3	165.36	$4.84^{16°}$	†
8	oxyiodide	$NiI_2.9NiO.15H_2O$	1254.9	....	....
9	perchlorate	$Ni(ClO_4)_2.5H_2O$	347.680	....	149°
10	phosphate	$Ni_3(PO_4)_2.7H_2O$	492.23	....	....
11	phosphide	Ni_3P_2	238.12	5.99	....
12	"	Ni_2P	148.40	$6.3^{15°}$	....
13	pyrophosphate	$Ni_2P_2O_7.6H_2O$	399.54	$‡3.9303^{25°}$	....
14	potassium cyanide	$Ni(CN)_2.2KCN.H_2O$	258.94	$1.875^{11°}$	H_2O, 100°
15	selenide	$NiSe$	137.88	8.46	....
16	sulphate	$NiSO_4$	154.75	$3.418^{15°}$	SO_3, 840°
17	"	$NiSO_4.6H_2O$	262.85	2.031	$6H_2O$,280°
18	"	$NiSO_4.7H_2O$	280.86	1.98	98°–100°
19	sulphide mono-	NiS	90.75	4.60	797°
20	" sub-	Ni_2S	149.43	5.52	....
21	sulphite	$NiSO_3.6H_2O$	246.85	....	....
22	**Nickelo-nickelic** oxide	Ni_3O_4	240.04	....	....
23	sulphide	Ni_3S_4	304.32	....	....
24	**Niobium**	Nb	93.5	12.7	2200°
25	bromide	$NbBr_5$	493.10	....	150°
26	chloride	$NbCl_5$	270.80	$2.77–2.73^{\frac{20°}{20}}$	....
27	fluoride	NbF_5	188.5	$3.2932^{18°}$	72–73°
28	oxide	Nb_2O_5	267.0	4.8	....
29	**Nitric Acid**	HNO_3	63.02	$1.530^{\frac{15}{0}}$	−41.3
30	**Nitrogen**	N_2	28.02	0.96737 A.	−210.5°¶
31	bromophosphide	$NPBr_2$	204.89	....	....
32	chloride	NCl_3	120.39	1.653	expl. 95°
33	chlorophosphide	$N_3P_3Cl_6$	347.91	1.98	114°
34	iodoazoimide	NH_3NI_3	411.80	3.5	explodes
35	oxide mon-(nitrous)	N_2O	44.02	$.937^{0}$ 1.530 A	−102.3°
36	" di- (nitric)	$NO(N_2O_2)$	30.01	1.0367 A.	−167° ...
37	oxide tri-	N_2O_3	76.02	$1.447^{-2°}$	−111°

* Absorbs oxygen at 400°. † Is reduced to NiO at 600°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	insoluble	soluble acids, NH_3aq...	black.........
2	....	$124.2^{0°}$	$188.2^{100°}$	....	black scales....
3	....	decomp.	....	soluble NH_3aq........	....
4	136.7°	$238.5^{0°}$	∞	soluble alcohol, NH_3aq.	green monocl...
5	....	v. soluble	....	insoluble alcohol......	....
6	....	insoluble	....	soluble acids, NH_3aq...	green octahedral
7	....	insoluble	....	soluble HCl, NH_3aq....	black........
8	....	insoluble	....	sol. HNO_3; insol. NH_3 aq	.......[needles
9	....	$222.5^{0°}$	$273.7^{45°}$	sol. al. acet., insol. $CHCl_3$	green hexag.
10	....	insoluble	insoluble	soluble acids, NH_4 salts	green.........
11	....	insoluble	insoluble	insoluble HCl.........	dark green.....
12	....	insoluble	....	insol. a.; sol. HNO_3 + HF	gray crystals...
13	....	insoluble	....	soluble acids, NH_3aq...	green....[clinic
14	....	soluble	....	decomp. by acids......	red yel. mono-
15	....	insoluble	....	sol. HNO_3, aqua regia..	crystalline.....
16	....	$29.3^{0°}$	$83.7^{100°}$	insoluble alcohol, ether.	yellow regular..
17	....	$62.52^{0°}$	$340.7^{100°}$	v. soluble al., NH_3aq....	bluish tetrag. green monocl.
18	§	$75.6^{15.5°}$	$475.8^{100°}$	v. soluble alcohol......	green rhombic or monoclinic
19	....	0.00036	decomp.	sol. HNO_3, aqua regia..	black hexag....
20	....	insoluble	....	soluble HNO	yellow crystals.
21	....	insoluble	....	soluble HCl, H_2SO_3	green tetrahed..
22	....	insoluble	....	soluble acids..........	gray..........
23	....	insoluble	....	soluble HNO_3.........	grayish black rhombohedral
24	....	....	....	insol. a., aq. r........	rhombic gray..
25	270°	decomp.	....	....	green prisms...
26	245°	....	....	....	....
27	220°	soluble	....	....	monocl. prisms
28	....	....	....	....	....
29	86°	∞	....	∞	....
30	−195.5°	$2.348c.c.^{0°}$	$1.542c.c.^{20°}$	s. soluble alcohol......	crystals.......
31	....	insoluble	....	sol. ether, CS_2, $CHCl_3$..	....
32	....	soluble	decomp.	sol. CS_2, PCl_3, $CHCl_3$...	yellowish oil...
33	255°	decomp.	....	sol. al., ether, $CHCl_3$...	trimetric......
34	....	decomp.	explodes	sol. HCl, KCN, $Na_2S_2O_3$ insol. ab. al.	red ortho-rhombic.....
35	−89.8°	$130.52^{0°}$	$60.82^{24°}$	soluble al., conc. H_2SO_4	....
36	−150.2°	$7.3c.c.^{0°}$	$0.0c.c.^{100°}$	3.5 c.c. conc. H_2SO_4. 26.6 al., $FeSO_4$aq.	.... [brown gas
37	3.5°	soluble	....	sol. HNO_3, H_2SO_4, ether	blue solid, or red

‡ The anhydrous salt. § Loses $6H_2O$ at 103°. ¶ At 84 mm.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Nitrogen				
1	oxide tetr-	$NO_2(N_2O_4)$	46.01	1.4903^{0}_{4}	−9.6°
2	" pent-	N_2O_5	108.02	$1.642^{18°}$	30°
3	oxybromide (nitrosyl bromide)	NOBr	109.93	>1.0	−2°
4	oxychloride (nitrosyl chloride)	NOCl	65.47	$1.4165^{-12°}$	−60°
5	selenide	NSe	93.21	....	explodes
6	sulphide	N_4S_4	184.28	$2.22^{15°}$	188°
7	" penta-	N_2S_5	188.37	1.901^{18}_{4}	10°–11°
8	sulphochloride	NS_3Cl	113.62	....	decomp.
9	**Nitroxyl fluoride**	NO_2F	65.01	2.24 A.	−139°
10	**Osmium**	Os	190.9	.... 22.48	2700° 2700°
11	ammonium trichloride	$2(OsCl_3.2NH_4Cl)3H_2O$	862.62	....	....
12	chloride di-	$OsCl_2$	261.82	....	[600°
13	chloride tri-	$OsCl_3$	297.28	....	dec. 560°–
14	" tri-	$OsCl_3.3H_2O$	351.33	....	....
15	" tetra-	$OsCl_4$	332.74	....	....
16	oxide mon-	OsO	206.90	....	....
17	" sesqui-	Os_2O_3	429.80	....	....
18	" di-	OsO_2	222.90	....	....
19	" tetra-	OsO_4	254.90	8.89	20°
20	potassium trichloride	$2(OsCl_3.3KCl)6H_2O$	1150.0	....	‡
21	potassium tetrachloride	$OsCl_4.2KCl$	481.86	....	¶
22	sulphide di-	OsS_2	255.04	....	....
23	" tetra-	OsS_4	319.18	....	oxidizes
24	sulphite	$OsSO_3$	270.97	....	....
25	**Oxalic Acid**	$H_2C_2O_4.2H_2O$	126.05	$1.653^{18.5°}$	98°
26	**Oxygen**	O_2	32.00	1.10535 A.	−227°
27	**Ozone**	O_3	48.00	1.658 A.	dec. 270°
28	**Palladium**	Pd	106.7	11.4–11.9	1550°
29	bromide	$PdBr_2$	266.54	....	....
30	chloride	$PdCl_2.2H_2O$	213.65	....	....
31	cyanide	$Pd(CN)_2$	158.72	....	decomp.
32	fluoride	PdF_2	144.70	....	....
33	hydride	Pd_2H	214.41	11.06	decomp.
34	hydroxide	$Pd(OH)_2$	140.72	....	....

* At 751 mm. † Sublimes at 135°.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	21.64°	soluble	....	sol. CS_2, $CHCl_3$, conc. HNO_3, H_2SO_4	reddish yellow.
2	45°–50°	soluble	....	....	rhombic.......
3	....	decomp.	decomp.	....	dark brown....
4	−5.6°*	lecomp.	....	....	solid, lem. yel. crys., or. red.
5	200°	insoluble	....	soluble HNO_3, CS_2.....	orange yellow..
6	†	insoluble	decomp.	sol. CS_2, al., ether......	orange r. mono.
7	decomp.	insoluble	....	s. sol. CS_2, alcohol.....	red...........
8	....	soluble	decomp.	soluble CS_2..........	citron yellow...
9	−63.5°	decomp.	....	....	....
10	....	insoluble	insoluble	s. sol. HNO_3, aqua regia	bluish amorph..
	....	insoluble	insoluble	insol. acids, aqua regia.	bluish.........
11	....	v. soluble	decomp.	v. sol. al.; insol. ether..	red. brown crys.
12	....	insoluble	....	sol. al., ether, NaCl....	green needles..
13	....	s. soluble	....	sol. alk., al., HCl. s. sol. ether	brownish reg...
14	....	s. soluble	....	sol. alk., HCl.........	.......[needles
15	....	soluble	....	soluble HCl, alcohol...	red to yellow
16	....	insoluble	insoluble	insoluble acids........	grayish black..
17	....	insoluble	....	insoluble acids........	black.........
18	....	insoluble	....	insoluble acids........	copper red.....
19	100°	v. soluble	v. soluble	sol. al., ether, NH_3 aq. .	monoclinic ....
20	....	v. soluble	....	v. soluble al.; insol. ether	dark red cryst..
21	....	s. soluble	....	insoluble al., HCl......	red octahedra..
22	....	s. soluble	....	insoluble alkalies......	brownish yel...
23	....	insoluble	....	soluble HNO_3 insol. alk.	brownish black.
24	....	insoluble	....	soluble HCl...........	bluish black...
25	....	$4.9^{0°}$	$120^{70°}$	soluble alcohol........	crystalline.....
26	−182.7°	4.89 c.c.$^{0°}$	2.61c.c.30°	sol. melted Ag.; s. sol. al.	....
27	−119°	0.88	....	oil of turp. and cinnamon	....
28	....	insoluble	insoluble	sol. conc. a., aqua regia	regular hexag. .
29	....	insoluble	insoluble	soluble HBr..........	brown........
30	....	soluble	soluble	soluble HCl	red brown pris..
31	....	insoluble	insoluble	soluble KCN, NH_3 aq. .	yellow.........
32	....	s. soluble	....	soluble HF..........	brown.........
33	....	....	....	....	....
34	....	insoluble	....	sol. acids, alk.........	brown.........

‡ Loses $6H_2O$ at 150°–180°. ¶ Decomposes at red heat.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Palladium iodide	PdI_2	360.54		100°
2	nitrate	$Pd(NO_3)_2$	230.72		decomp.
3	oxide sub-	Pd_2O	229.40		*
4	" mon-	PdO	122.70		O, 875°
5	" di-	PdO_2	138.70		O, 200°
6	sulphate	$PdSO_4.2H_2O$	238.80		
7	sulphide sub-	Pd_2S	245.47	$7.303^{15°}$	red heat
8	" mono-	PdS	138.77		oxidizes
9	" di-	PdS_2	170.84		decomp.
10	Pallados diammonium chloride	$PdCl_2.2NH_3$	211.69		
11	hydroxide	$Pd(OH)_2.2NH$	174.78		dec.<100°
12	Perchloric Acid	$HClO_4$	100.47	1.764^{22}_{4}	
13	" "	$HClO_4.H_2O$	118.49	1.7756^{50}_{4}	50°
14	" "	$HClO_4.2H_2O$	136.50	1.65	−20.6°
15	Periodic Acid	$HIO_4.2H_2O$	227.96		130°
16	Permanganic Acid	$HMnO_4$	119.96		
17	Permolybdic Acid	$HMoO_4.2H_2O$	197.04		
18	Phosphamic Acid	$PONH_2.(OH)_2$	97.04		decomp.
19	Phosphine	PH_3	34.06	1.185 A.	−133.5°
20	" liquid	P_2H_4	66.11	1.007–1.016	< −10°
21	" solid	$(P_4H_2)_3$	378.53	$1.83^{19°}$	burns 200°
22	Phosphonium bromide	PH_4Br	114.99	1.906 A.	30°
23	" chloride	PH_4Cl	70.53		26°
24	" hydroxide	PH_4OH	52.08		
25	" iodide	PH_4I	161.99	2.86	
26	" sulphate	$(PH_4)_2SO_4$	166.21		
27	Phosphoric Acid hypo-	$H_4P_2O_6$	162.15		55°
28	meta-	HPO_3	80.05	2.2–2.488	†
29	ortho-	H_3PO_4	98.14	$1.884^{18.2°}$	38.6°
30	pyro-	$H_4P_2O_7$	178.11		61°
	Phosphorous Acid				
31	hypo-	H_3PO_2	66.06	$1.493^{18.8°}$	26.5°
32	ortho-	H_3PO_3	82.06	$1.651^{21.2°}$	70.1°
33	pyro-	$H_4P_2O_5$	146.11		38°
34	Phosphorous yellow	P_4	124.16	$1.831^{18°}$	44.1°
35	" red	P_4	124.16	$2.296^{16°}$	725°
36	bromide tri-	PBr_3	271.04	2.8847	−41.5°

* Decomposes at red heat. † Sublimes at white heat.

Number	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	360°	insoluble	insoluble	insol. al., ether; sol. KI	black
2	....	soluble	decomp.	soluble HNO_3	brown yel. rhom
3	....	insoluble	....	insoluble acids	black
4	....	insoluble	....	s. soluble acids	black
5	....	insoluble	....	s. soluble acids	black
6	....	v. soluble	decomp.	....	brown crystals.
7	....	insoluble	....	insol. acids; sol. aq. regia	gray
8	....	insoluble	....	soluble HCl; insoluble $(NH_4)_2S$	black
9	....	insoluble	....	soluble aqua regia	dark brown
10	....	s. soluble	....	soluble acids, NH_3aq	yel. or red crys.
11	....	soluble	decomp.	....	crystalline
12	39°	soluble	....	....	oily
13	decomp.	soluble	....	....	needles
14	200°	v. soluble	....	soluble alcohol	crystalline
15	734°	v. soluble	....	soluble alcohol, ether	monoclinic
16	....	v. soluble	decomp.	....	....
17	....	v. soluble	v. soluble	....	white crystals.
18	....	v. soluble	....	....	....
19	−85°	s. soluble	insoluble	sol. al., ether, Cu_2Cl_2	....
20	57°–58°	insoluble	....	sol. al., turpentine	....
21	....	insoluble	insoluble	insol. al., sol. P., P_2H_4	yellow
22	....	decomp.	decomp.	....	regular
23	sublimes	decomp.	....	....	regular
24	....	....	....	....	crystalline
25	80°	decomp.	....	decomp. by alcohol	tetrag. prisms.
26	....	decomp.	....	....	crystals
27	dec. 70°	soluble	....	....	crystals
28	....	soluble	soluble	....	glassy
29	‡	v. soluble	....	soluble alcohol	rhombic
30	−10	v. soluble	decomp.	v. soluble	needles
31	decomp.	∞	∞	....	tablets
32	§	∞	∞	....	crystalline
33	¶	decomp.	....	....	needles
34	290°	0.00033	s. soluble	$1.5^{0°}$, $10^{81°}$ benzol; 0.4 al.; 1000 CS_2; $.43^{0°}$, $2^{35°}$ ether; sol. alk.	yellow regular.
35	350° (yel.)	insoluble	insoluble	insol. ether, CS_2; sol. alk.	red hexagonal rhombohedral
36	175.3°	decomp.	....	soluble CS_2, ether, $CHCl_3$	....

‡ Loses ½ H_2O at 213°. § Decomposes at 200°. ¶ Decomposes at 130°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (A).	Melting Point, °C.
	Phosphorus				
1	bromide penta-....	PBr_5	430.64	....	100°
2	bromofluoride.....	PBr_2F_3............	247.88	....	−20°
3	bromonitride......	PBr_2N............	204.89	....	188°–190°
4	bromotrichloride di	PBr_2Cl_3............	297.26	....	35°
5	" octo-	PBr_8Cl_3..........	776.88	....	25°
6	" tetra-	PBr_4Cl_3..........	457.10	....	....
7	chloride tri-.......	PCl_3.............	137.42	1.6128^{0}_{4}	−111.8°
8	" penta-....	PCl_5.............	208.34	$3.60^{296°}$ D.	148°†
9	chlorofluoride....	PCl_2F_3............	158.96	....	−8°
10	fluoride tri-.......	PF_3..............	88.04	....	−160°
11	" penta-....	PF_5..............	126.04	4.30 D.	−83°
12	hepta bromide dichloride	PBr_7Cl_2	661.40	....	....
13	iodide di-.........	P_2I_4..............	284.82	....	110°
14	" tri-.........	PI_3..............	411.80	....	61°
15	iodochloride......	PI_2Cl_3............	360.26	....	....
16	monobromtetrachloride	$PBrCl_4$...........	252.81	....	....
17	nitride..........	P_3N_5.............	163.17	2.51^{18}	§
18	oxide tri-.........	P_4O_6.............	220.16	2.135^{21}_{4}	22.5°
19	" tetr-........	P_2O_4.............	126.08	$2.537\frac{22.6}{4}$	>100°
20	" pent-.......	P_2O_5.............	142.08	2.387......	
21	oxybromide.......	$POBr_3$............	286.80	2.822	55.5°
22	oxybromdichloride	$POBr.Cl_2$..........	197.88	2.049^{0}_{4}	13°
23	oxychloride.......	$POCl_3$............	153.42	1.71163^{0}_{4}	1.25°
24	oxyfluoride.......	POF_3.............	104.04	....	−68°
25	oxyiodide.........	$P_3O_8I_6$...........	982.64	....	140°
26	oxynitride........	PON............	61.05	....	red heat .
27	selenide sub-......	P_4Se............	203.36	....	−12°
28	" mono-....	P_2Se............	141.28	....	....
29	" tri-.......	P_2Se_3...........	299.68	....	....
30	" penta.....	P_2Se_5...........	458.08	....	....
31	sulphide sesqui-...	P_4S_3.............	220.37	$2.00^{11°}$	172°
32	" tri-......	P_4S_6.............	316.58	....	290°
33	" di-.......	P_3S_6.............	285.54	....	297°
34	" penta-....	P_2S_5.............	222.43	2.03	290°
35	sulphobromchloride	$PSBrCl_2$..........	213.95	2.12^{0}_{4}	−30°
36	sulphobromide....	$PSBr_3$............	302.87	$2.85^{17°}$	36.4°–38°
37	"	$PSBr_3.H_2O$........	320.89	$2.7937^{18°}$	35°
38	sulphochloride.....	$PSCl_3$............	169.49	$1.634^{22°}$	−35°

* In vacuo. † Under pressure. ‡ Decomposes at 250°.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
					[rhomboidal
1	106°	decomp.	....	....	citron yellow
2	....	decomp.	....	....	pale yellow....
3	150°*	....	....	sol. ether, CS_2, $CHCl_3$..	....
4	....	....	....	....	orange crystals.
5	....	....	....	....	brown needles..
6	....	decomp.	....	....	dark red cryst..
7	76°	decomp.	decomp.	sol. CS_2, ether, $CHCl_3$..	....
8	160°–165°	decomp.	....	sol. CS_2, C_6H_5COCl....	yellow rhombic.
9	‡	decomp.	....	soluble alcohol........	....
10	−95°	decomp.	....	soluble alcohol, alkalies	....
11	−75°	decomp.	....	....	....
12	....	decomp.	....	soluble PCl_3..........	prismatic.....
13	....	decomp.	....	soluble CS_2..........	orange prisms..
14	decomp.	decomp.	decomp.	soluble CS_2..........	red prisms.....
15	....	decomp.	....	soluble CS_2..........	red hexagonal .
16	....	decomp.	....	....	yellow crystals.
17	....	insoluble	s. decomp.	....	amorphous ....
18	173.1°	soluble	decomp.	sol. CS_2, ether, $CHCl_3$...	liquid or monocl.
19	180°	soluble	....	....	orthorhombic..
20	....	v. soluble	....	soluble conc. H_2SO_4....	amorphous ....
21	189.5°	decomp.	....	sol. ether, con. H_2SO_4, CS_2	plates........
22	137.6°	decomp.	....	....	tablets.......
23	107.2°	decomp.	decomp.	decomp...............	tablets.......
24	−40°	decomp.	....	decomp. by alcohol....	crystalline....
25	decomp.	soluble	....	soluble alcohol, ether ..	red crystals....
26	....	insoluble	....	insoluble acids, alkalies	amorphous ....
27	burns	decomp.	....	sol. CS_2; insol. al., ether	dark yellow....
28	....	decomp.	....	s. sol. CS_2; insol. al., ether	red..........
29	....	....	decomp.	sol. KOH; insol. CS_2...	dark red......
30	....	decomp.	....	sol. CCl_4; insol. CS_2....	dark red need..
31	407.8°	insoluble	decomp.	sol. CS_2, PCl_3, $PSCl_3$...	yellow rhomb..
32	490°	decomp.	....	sol. al., ether, alkalies..	yellow crystals.
33	¶337°	....	....	s. soluble CS_2..........	yellow needles.
34	518°–520°	decomp	....	sol. CS_2, alkalies.......	yellow crystals.
35	150°	decomp.	....	....	yellow.......
36	decomp.	decomp.	....	sol. CS_2, ether, PCl_3, PBr_3	yellow octah..
37	....	....	....	....	yellow crystal
38	125°	decomp.	....	soluble CS_2..........	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Phosphorus				
1	sulphocyanate	$P(CNS)_3$	205.28	$1.625^{18°}$	$< -20°$
2	sulphofluoride	PSF_3	120.11		
3	sulphoxide	$P_4S_4O_6$	348.44		102°
4	thioamide	$PS(NH_2)_3$	111.16	$1.7^{13°}$	dec. 200°
5	trioxytetrachloride	$P_2O_3Cl_4$	251.92	$1.78^{7°}$	
6	trisulphotetrabromide	$P_2S_3Br_4$	477.97	$2.262^{17°}$	
7	**Phosphotungstic Acid**	$P_2O_5.12WO_3 42H_2O$	3682.8		
8	**Platinic Acid** brom-	$H_2PtBr_6.9H_2O$	838.88		dec. 100°
9	“ “ chlor-	$H_2PtCl_6.6H_2O$	518.07	2.431	decomp.
10	“ “ iodo-	$H_2PtI_6.9H_2O$	1120.9		
11	**Platino-platinic** oxide	Pt_3O_4	649.60		†
12	**Platinum**	Pt	195.2	21.16^{24}_{4}	1753°
13	bromide di-	$PtBr_2$	355.04		dec. 300°
14	“ tetra-	$PtBr_4$	514.88		
15	chloride di-	$PtCl_2$	266.12	$5.87^{11°}$	†
16	“ tetra-	$PtCl_4$	337.04		decomp.
17	“ “	$PtCl_4.5H_2O$	427.02	2.43	$4H_2O$, 100°
18	cyanide	$Pt(CN)_2$	247.22		
19	fluoride	PtF_4	271.20		†
20	hydroxide (-ous)	$Pt(OH)_2$	229.22		
21	“ “	$Pt(OH)_2.2H_2O$	265.25		$2H_2O$, 100°
22	“ (-ic)	$Pt(OH)_4$	263.23		decomp
23	iodide di-	PtI_2	449.04		‡
24	“ tetra-	PtI_4	702.88		
25	oxide mon-	PtO	211.2		555°
26	“ di-	PtO_2	227.2		430°
27	“ “	$PtO_2.H_2O$	245.22		H_2O, 100°
28	“ “	$PtO_2.2H_2O$	263.23		H_2O, 100°
29	“ “	$PtO_2.3H_2O$	281.25		dec. 300°
30	“ “	$PtO_2.4H_2O$	299.27		decomp.
31	sulphide mono-	PtS	227.27	8.897	decomp.
32	“ di-	PtS_2	259.34	5.27	decomp.
33	“ sesqui-	Pt_2S_3	486.61	5.52	
34	sulphate	$Pt(SO_4)_2.4H_2O$	459.40		
35	**Potassium**	K	39.10	$0.875^{13°}$	62.5°
36	acetate	$KC_2H_3O_2$	98.12		
37	“ acid	$KH(C_2H_3O_2)_2$	158.16		148°
	aluminate	$K_2Al_2O_4.3H_2O$	250.45		

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	265°	decomp.	....	sol. al., ether, CS_2, $CHCl_3$	....
2	3.8°*	decomp.	....	s. sol. ether; insol. CS_2..	gas..........
3	295°	decomp.	....	50, CS_2..............	tetragonal.....
4	....	s. soluble	decomp.	....	yellow amorph..
5	210°–215°	decomp.	....	....	....
6	decomp.	....	....	....	yellow oil.....
7	....	soluble	....	soluble alcohol, ether ..	....
8	....	v. soluble	v. soluble	v. sol. al., ether, $CHCl_3$.	red monoclinic.
9	....	v. soluble	v. soluble	soluble alcohol, ether...	red brown.....
10	....	sol. and dec.	....	....	brown monocl..
11	....	insoluble	....	insoluble acids........	black........
12	....	insoluble	insoluble	sol. aq. r., fused alk....	grayish........
13	....	insoluble	insoluble	soluble HBr, KBr	brown.........
14	....	$0.41^{20°}$	s. soluble	sol. al., ether, HBr.....	dark brown....
15	....	insoluble	insoluble	soluble HCl, NH_3 aq...	brown.........
16	....	v. soluble	....	soluble alcohol, ether...	brown.........
17	....	v. soluble	s. soluble	soluble alcohol, ether...	red monoclinic.
18	....	insoluble	insoluble	insoluble alkalies......	yellow-brown ..
19	....	sol. and dec.	....	....	buff crystals...
20	....	insoluble	insoluble	sol. HCl, HBr, SO_2aq.alk	black.........
21	....	insoluble	insoluble	sol. acids, alkalies.....	yellow........
22	....	insoluble	insoluble	v. sol. acids, alkalies...	reddish brown .
23	....	insoluble	insoluble	insol. a.; sol. Na_2SO_3 ...	black.........
24	....	insoluble	....	sol. alk., HI, KI.......	br. black amor..
25	....	insoluble	....	sol. H_2SO_3, conc. HCl ..	violet to black..
26	....	insoluble	....	insoluble acids........	black.........
27	....	insoluble	....	sol. HCl, NaOH; insol. $H.C_2H_3O_2$	yellow........
28	....	insoluble	....	....	brown.........
29	....	insoluble	insoluble	insol. HCl, aq. r.......	black.........
30	....	insoluble	insoluble	sol. acids.............	yellow needles .
31	....	insoluble	....	insol. a.; sol. $(NH_4)_2S$ ..	black. .[needles
32	....	insoluble	....	sol. $(NH_4)_2S$, aqua regia	black or gray
33	....	insoluble	....	insol. a.; sol. aqua regia.	steel gray .....
34	....	soluble	decomp.	sol. a., al., ether.......	yellow plates...
35	757.5°	decomp.	decomp.	sol. a., al., mercury....	....
36	....	$188^{2°}$	$492^{62°}$	33 alcohol; insol. ether	....
37	¶	decomp.	....	sol. glac. $H.C_2H_3O_2$....	needles plates..
38	....	v. soluble	....	insol. al.; sol. alk.......	crystals.. ....

‡ Decomposes at 300°–350°. ¶ Decomposes at 200°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Potassium amid	KH_2N	55.13	....	271°
2	antimonate	$KSbO_3$	207.30	....	....
3	antimonyl tartrate	$KSbOC_4H_4O_6.\frac{1}{2}H_2O$	332.34	2.6	$\frac{1}{2}H_2O$,100°
4	arsenate	K_3AsO_4	256.26	....	....
5	"	K_2HAsO_4	218.17	....	....
6	arsenate acid	KH_2AsO_4	180.08	2.851	288°
7	arsenite	$KAsO_2$	146.06	....	....
8	" acid	$KH(AsO_2)_2.H_2O$	272.04	....	....
9	aurate	$KAuO_2.3H_2O$	322.35	....	....
10	auricyanide	$KAu(CN)_4.1\frac{1}{2}H_2O$	367.36	....	$1\frac{1}{2}H_2O$
11	aurocyanide	$KAu(CN)_2$	288.32	....	....
12	benzoate	$KC_7H_5O_2.3H_2O$	214.19	....	....
13	borate meta-	$K_2B_2O_4$	164.20	....	947°
14	" tetra-	$K_2B_4O_7.5H_2O$	324.28	1.74 †	$5H_2O$,r. h.
15	borofluoride	KBF_4	126.10	$2.498^{20°}$	....
16	borotartrate	$KC_4H_4BO_7$	214.13	1.832	....
17	bromate	$KBrO_3$	167.02	$3.271\frac{17.5}{17.5}$	434°
18	bromide	KBr	119.02	2.756^{20}_{4}	730°
19	bromoaurate	$KAuBr_4$	555.97	....	decomp.
20	"	$KAuBr_4.2H_2O$	592.01	....	....
21	bromoplatinate	K_2PtBr_6	752.91	$4.658^{24°}_{4}$	....
22	bromoplatinite	K_2PtBr_4	593.08	....	....
23	carbonate	K_2CO_3	138.20	$2.3312^{17°}$	909°
24	"	$K_2CO_3.2H_2O$	174.23	2.043	....
25	"	$2K_2CO_3.3H_2O$	330.45	....	....
26	" acid	$KHCO_3$	100.11	2.17	‖
27	chlorate	$KClO_3$	122.56	$2.337^{18°}$	357°
28	chloride	KCl	74.56	1.994^{15}_{4}	772°
29	chloraurate	$KAuCl_4$	378.14	....	....
30	chlorochromate	$KOClCrO_2$	174.66	2.497	....
31	chloroiridate	K_2IrCl_6	484.06	3.546	decomp.
32	chloropalladate	K_2PdCl_6	397.66	2.74–2.81	decomp.
33	chloropalladite	K_2PdCl_4	326.74	2.738	decomp.
34	chloroplatinate	K_2PtCl_6	486.16	$3.499^{24°}_{4}$	decomp.
35	chloroplatinite	K_2PtCl_4	415.44	$3.291^{21°}$	....
36	chlororhodite	$K_3RhCl_6.3H_2O$	487.01	....	decomp.
37	chlorostannate	K_2SnCl_6	409.96	2.687	....
38	chromate	K_2CrO_4	194.20	$2.7319^{18°}$	971°
39	citrate	$K_3C\ H_5O_7.H_2O$	324.36	1.98	decomp.
40	cobalticyanide	$K_3Co(CN)_6$	332.33	1.906	....
41	cobaltinitrite	$2Co(NO_2)_3.6KNO_2.3H_2O$	958.71	....	dec. 200°

* Decomposes at 200°. † Anhydrous. ‡ Sublimes at white heat.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	400°	decomp.	....	decomp. by alcohol...	green........
2	....	insoluble	s. soluble	sol. warm KOH.......	crystals......
3	....	$5^{8°}$	$52^{100°}$	insoluble alcohol.......	octahedra....
4	....	18.87	v. soluble	4 alcohol............	needles.......
5	....	soluble	....	....	....
6	....	$19^{6°}$	v. soluble	insoluble alcohol.......	crystalline....
7	....	soluble	....	s. soluble alcohol......	....
8	....	soluble	....	s. soluble alcohol......	....
9	....	v. soluble	decomp.	soluble alcohol........	....
10	*	soluble	v. soluble	soluble alcohol........	tablets..[hedra
11	....	14.3	200	s. sol. al.; insol. ether..	rhombic octa-
12	decomp.	$124.1^{17.5°}$	$161^{50°}$	....	....
13	....	$71^{30°}$	v. soluble	....	hexag. prisms.
14	....	$26.7^{30°}$	v. soluble	....	hexag. prisms..
15	decomp.	1.42	$6.25^{100°}$	soluble alk.; insol. al...	hexag. tablets.
16	....	....	....	....	....
17	decomp.	$3.1^{0°}$	$50^{100°}$	insoluble alcohol.......	rhombohedral.
18	‡	$53.48^{0°}$	$102.04^{100°}$	s. sol. alcohol, ether....	regular.......
19	....	s. soluble	....	soluble alcohol........	monoclinic....
20	....	$19.5^{15°}$	$204^{67°}$	sol. KBr; dec. by ether.	....
21	....	$2.07^{10°}$	$10^{100°}$	....	red regular ...
22	....	v. soluble	v. soluble	....	brown rhombic
23	§	$89.4^{0°}$	$156^{100°}$	insoluble alcohol.......	....
24	....	$146.9^{0°}$	$331^{100°}$	....	rhombic......
25	....	$129.4^{0°}$	$268.3^{100°}$	....	monoclinic....
26	....	$22.4^{0°}$	$60^{60°}$	insol. al.; sol. K_2CO_3aq..	monoclinic....
27	¶	$3.3^{0°}$	$60^{104.8°}$	0.833 alcohol; sol. alk..	monoclinic....
28	subl. w. h.	$28.5^{0°}$	$56.6^{100°}$	soluble alcohol, alkalies	regular.......
29	....	$27.7^{10°}$	$80.2^{60°}$	soluble alcohol........	yellow needles
30	....	sol. and dec.	....	soluble acids..........	red prisms....
31	....	$1.25^{19°}$	6.67	insoluble al., KCl......	black octahed.
32	....	s. soluble	decomp.	s. sol. HCl; insol. al....	red regular ...
33	....	soluble	v. soluble	insol.al.; sol.KCl,NH_3aq.	yellow regular
34	....	$0.48^{2°}$	$5.18^{100°}$	insol. al., ether.......	yellow regular
35	....	16.6	v. soluble	insoluble alcohol.......	red tetrag....
36	....	s. soluble	decomp.	insoluble alcohol.......	red triclinic...
37	....	soluble	....	....	....
38	....	$61.5^{0°}$	$81.8^{106.1°}$	insoluble alcohol.......	yellow rhomb.
39	....	$199.7^{31°}$	....	....	....
40	....	v. soluble	....	insoluble alcohol.......	yellow rhombic
41	....	$0.09^{0°}$	s. soluble	insoluble alcohol, ether.	yel. tetragonal prisms

§ Decomposes at 810°. ‖ Decomposes at 100°–200°. ¶ Decomposes at 400°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Potassium				
1	cobaltocyanide	$K_4Co(CN)_6$	371.43	....	....
2	cobaltosulphate	$K_2SO_4.CoSO_4.6H_2O$	437.41	2.2122^{20}_{4}	....
3	cyanate	KCNO	81.11	2.048	fuses
4	cyanide	KCN	65.11	$1.52^{16°}$	red heat
5	dichromate	$K_2Cr_2O_7$	294.20	$2.692^{4°}$	396°
6	ferricyanide	$K_3Fe(CN)_6$	329.20	$1.8109^{17°}$	decomp.
7	ferric oxalate	$KFe(C_2O_4)_2.2\frac{1}{2}H_2O$	315.98	....	decomp.
8	" "	$K_3Fe(C_2O_4)_3.3H_2O$	491.19	....	$3H_2O$, 100
9	ferrocyanide	$K_4Fe(CN)_6.3H_2O$	422.35	$1.8533^{17°}$	†
10	fluoride	KF	58.10	2.454	789°–885°
11	"	$KF.2H_2O$	94.13	2.454	41°
12	" acid	KHF_2	78.11	....	decomp.
13	fluogermanate	K_2GeF_4	264.7	....	....
14	fluostannate	$K_2SnF_6.H_2O$	329.22	3.053	....
15	fluosilicate	K_2SiF_6	220.50	$2.665\frac{17.5}{4}$	‡
16	fluotitanate	$K_2TiF_6.H_2O$	258.32	0	....
17	fluozirconate	K_2ZrF_6	282.80	3.582	....
18	formate	$KCHO_2$	84.11	1.908	150°
19	hydride	KH	79.26	0.80	decomp.
20	hydrosulphide	KSH	72.18	2	decomp.
21	hydroxide	KOH	56.11	2.044	360.4°
22	hypochlorite	KClO	90.56	....	decomp.
23	hypophosphite	KH_2PO_2	104.16	....	burns....
24	iodate	KIO_3	214.02	$3.975^{18°}$	560°
25	" acid	$KH(IO_3)_2$	389.95	....	....
26	iodide	KI	166.02	$3.043^{24.3°}$	680°
27	" tri-	KI_3	419.86	$3.498^{15°}$	45°
28	iodobromide	KBr.IBr	325.86	....	decomp.
29	iodochloride	$KCl.ICl_3$	307.86	$1.176^{45°}$	decomp.
30	iodoiridite	K_3IrI_6	1072.0	....	....
31	magnesium chloride (carnallite)	$MgCl_2.KCl.6H_2O$	277.90	1.618	....
32	manganate	K_2MnO_4	197.13	....	dec. 190°
33	molybdate	K_2MoO_4	238.20	....	....
34	nickel sulphate	$K_2SO_4.NiSO_4.6H_2O$	437.11	2.124	....
35	nitrate	KNO_3	101.11	$2.1^{4°}$	337°
36	nitride	K_3N	131.31	....	....
37	nitrite	KNO_2	85.11	$1.195^{25°}$....	....
38	nitroprusside	$K_2Fe(CN)_5.NO.2H_2O$	330.13	....	....
39	osmate	$K_2OsO_4.2H_2O$	369.13	....	....
40	osmocyanide	$K_4Os(CN)_6.3H_2O$	557.41	....	....

* Decomposes at 230°. ‡ Decomposes at red heat.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	....	soluble	....	insoluble alcohol, ether.	amethyst need.
2	....	$25.4^{0°}$	....	$108.4^{49°}$..............	monoclinic pl...
3	....	soluble	....	insoluble alcohol.......	laminæ ....
4	red heat	v. soluble	$122.2^{103.3°}$	sol. glyc., al.	octahedra[clinic
5	dec. 1000°	$4.9^{0°}$	$102^{100°}$	insoluble alcohol.......	red tri. or mono-
6	....	$33^{4.5°}$	$77.5^{100°}$	s. soluble alcohol......	red monoclinic.
7	....	$92^{21°}$	decomp.	....	olive br. cryst..
8	*	$4.7^{0°}$	$117.7^{100°}$	insoluble alcohol.......	....
9	....	$27.8^{12.2°}$	$90.6^{96.3°}$	insoluble alcohol.......	yellow monocl..
10	....	$92.3^{18°}$	v. soluble	insol. alcohol; sol. HF..	....
11	....	$349.3^{18°}$	v. soluble	insol. alcohol; sol. HF..	regular........
12	....	$41^{21°}$	....	insol. al.; sol. $KC_2H_3O_2$	regular........
13	....	$6.45^{18°}$	$43.5^{100°}$	....	....
14	....	$3.7^{18°}$	$33.3^{100°}$	....	octahedra.....
15	....	$0.12^{17.5°}$	$0.955^{100°}$	insol. al.; sol. HCl.....	hexagonal.....
16	....	$0.556^{0°}$	$1.28^{20°}$	sol. HCl.............	....
17	....	$0.78^{2°}$	$25^{100°}$	....	rhombic.......
18	decomp.	$331^{18°}$	$657^{90°}$	....	rhombic.......
19	....	decomp.	decomp.	insol. benzine, ether, CS_2	crystalline.....
20	....	soluble	soluble	v. soluble alcohol......	yel. rhombohed.
21	subl. w. h.	$107^{15°}$	$178^{100°}$	v. soluble alcohol, ether	rhombh. ($2H_2O$)
22	....	v. soluble	v. soluble	....	....
23	....	v. soluble	....	sol. al.; insol. ether....	hexagonal.....
24	....	$4.74^{0°}$	$32.3^{100°}$	insol. al.; sol. KI......	regular...[clinic
25	....	$1.33^{15°}$	....	....	rhomb. or mono-
26	....	$126.1^{0°}$	$205.6^{100.7°}$	14.28 al.; sol. ether....	regular........
27	....	v. soluble	....	sol. alcohol, KI........	dark blue need..
28	....	....	....	....	....
29	....	decomp.	....	decomp. by ether......	yellow rhombic.
30	....	v. soluble	....	insoluble alcohol.......	green crystals..
31	....	$64.5^{18.75°}$	decomp.	decomp. by alcohol....	hexagonal.....
32	....	decomp.	....	sol. KOH.............	dark gr. rhomb.
33	....	v. soluble	....	insoluble alcohol.......	....
34	....	$7.0^{0°}$	$60.8^{75°}$	....	blue monoclinic
35	decomp.	$13.3^{0°}$	$247^{100°}$	insoluble alcohol, ether.	¶ ....
36	....	decomp.	....	....	dark gray ....
37	....	$300^{15.5°}$	....	insol. alcohol..........	prismatic......
38	....	$100^{16°}$	....	soluble alcohol........	red monoclinic.
39	....	s. soluble	soluble	insoluble alcohol, ether.	violet octahedra
40	....	s. soluble	soluble	insoluble alcohol, ether.	yellowish plates

† Loses $3H_2O$ at 60°–80°. ¶ Rhombohedral or prismatic.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Potassium oxalate...	$K_2C_2O_4.H_2O$	184.22	2.08	* decomp.
2	" acid.....	$KHC_2O_4.\frac{1}{2}H_2O$	137.12	2.088†	decomp.
3	" tetra-.....	$KH_3(C_2O_4)_2.2H_2O$	254.16	1.836	decomp.
4	oxide..........	K_2O	94.20	2.32^{0}_{0}	red heat
5	" per-........	K_2O_4	142.20	....	red heat
6	perchlorate......	$KClO_4$	138.56	$2.524^{10.8}_{4}$	610°
7	perchromate......	K_3CrO_8	297.30	....	dec. 170°
8	periodate.........	KIO_4	230.02	3.618^{15}_{4}	582°
9	permanganate.....	$KMnO_4$	158.03	$2.7032^{9.9}_{4}$	dec. 240°
10	persulphate.......	$K_2S_2O_8$	270.34	....	dec. < 100°
11	perruthenate	$KRuO_4$	204.80	....	dec. 440°
12	peruranate........	$K_2UO_5.3H_2O$	450.75	....	dec. 100°
13	phosphate ortho-..	K_3PO_4	212.34	....	....
14	" hydrogen .	K_2HPO_4	174.25	....	decomp.
15	" dihydrogen	KH_2PO_4	136.16	2.338^{20}_{4}	96°
16	" pyro-.....	$K_4P_2O_7.3H_2O$	384.53	2.33	$3H_2O$, 300
17	" meta-	$K_4P_4O_{12}.2H_2O$	472.56	$2.264^{14.5°}$	$2H_2O$, 100
18	phosphite.........	K_2HPO_3	158.25	....	decomp.
19	platinate.........	$K_2PtO_3.3H_2O$	375.45	....	....
20	platinocyanide....	$K_2Pt(CN)_4.3H_2O$	431.49	$2.4548^{16°}$	....
21	platinonitrite......	$K_2Pt(NO_2)_4$	457.24	....	....
22	plumbate.........	$K_2PbO_3.3H_2O$	387.15	....	....
23	ruthenate.........	$K_2RuO_4.H_2O$	261.92	....	H_2O, 200°
24	selenate..........	K_2SeO_4	221.40	3.066^{20}_{4}	....
25	silicate...........	K_2SiO_3	154.50	....	....
26	" tetra-......	$K_2Si_4O_9$	335.40	....	....
27	silver cyanide.....	$KAg(CN)_2$	199.00	....	....
28	sodium carbonate .	$KNaCO_3.6H_2O$	230.20	1.61	$6H_2O$,100°
29	" cobaltinitrite	$K_2NaCo(NO_2)_6.H_2O$	454.246	$1.6333^{25°}_{4}$	dec. 135°
30	stannate..........	$K_2SnO_3.3H_2O$	299.25	3.197	....
31	sulphate..........	K_2SO_4	174.27	2.6633^{20}_{4}	1072°
32	" acid......	$KHSO_4$	136.18	2.245	200°
33	" "	$KHSO_4$	136.18	2.612	....
34	" pyro-.....	$K_2S_2O_7$	254.34	2.27	>300°
35	sulphide mono-....	K_2S	110.27	2.13	....
36	" "	$K_2S.5HO$	200.35	....	$3H_2O$,150°
37	" di-.......	K_2S_2	142.34	....	....
38	" tri-.......	K_2S_3	174.41	....	....
39	" tetra-....	K_2S_4	206.48	....	dec. 850°
40	" penta-....	K_2S_5	238.55	....	....

* Decomposes at 411°. † Density of the anhydrous salt.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	$33^{16°}$	....	....	monoclinic.....
2	....	$2.2^{0°}$	$51.5^{100°}$	....	trimetric......
3	....	$1.8^{13°}$	....	....	triclinic........
4	....	v. soluble	v. soluble	soluble alcohol, ether ..	gray octahedral
5	decomp.	decomp.	....	decomp. by alcohol....	yellow leaflets..
6	*	$0.7^{0°}$	$19.8^{100°}$	s. sol. al.; insol. al., ether	rhombic.......
7	....	s. soluble	....	insol. al., ether........	brown octahed.
8	O, 300°	$0.66^{13°}$	soluble	s. soluble KOH	rhombic.......
9	....	$2.83^{0°}$	$32.35^{75°}$	sol. conc. H_2SO_4.......	dark red rhomb.
10	....	$0.564^{0°}$	$4.08^{40°}$	insoluble alcohol......	prismatic......
11	....	s. soluble	....	....	black quadratic
12	....	decomp.	decomp.	decomp. HCl..........	red crystals....
13	....	s. soluble	soluble	insoluble alcohol......	rhombic.......
14	....	v. soluble	v. soluble	v. soluble alcohol.....	....
15	H_2O, 400°	$25^{7°}$	....	insoluble alcohol......	tetragonal.....
16	....	soluble	v. soluble	insoluble alcohol......	....
17	....	s. soluble	....	soluble acids..........	amorphous ....
18	....	v. soluble	....	insoluble alcohol......	....
19	....	soluble	....	insoluble alcohol......	yel. rhombohed.
20	....	s. soluble	v. soluble	soluble alcohol, ether ..	yellow rhombic.
21	....	$3.8^{15°}$	soluble	....	monocl. prisms.
22	....	decomp.	decomp.	soluble KOH.........	rhombohedral..
23	....	v. soluble	....	....	black rhombic .
24	....	$110.5^{0°}$	$122.2^{100°}$	....	....
25	....	soluble	....	insoluble alcohol......	....
26	....	soluble	soluble	insoluble alcohol......	amorphous ....
27	....	$25^{20°}$	100	4, alcohol.............	regular........
28	....	$13^{12°}$	$20^{15°}$	....	monoclinic.....
29	....	.07 at 25°	....	insol. al., dil. ac. sol. a.	yellow ....
30	....	$106.6^{10°}$	$110.5^{20°}$	insol. al.; s. sol. KOH..	rhombohedral..
31	....	$8.5^{0°}$	$26.2^{100°}$	insoluble alcohol......	rhom. or hexag.
32	decomp.	$36.3^{0°}$	$121.6^{100°}$	decomp. by alcohol....	monoclinic.....
33	....	....	....	....	rhombic.......
34	....	soluble	decomp.	....	....
35	....	soluble	v. soluble	sol. al., glyc.; insol. ether	brown crystals.
36	....	soluble	....	sol. al., glyc.; insol. ether	orthorhombic..
37	....	soluble	decomp.	soluble alcohol........	yellowish red...
38	....	soluble	decomp.	soluble alcohol........	yellowish brown
39	....	soluble	....	soluble alcohol........	red brown
40	....	v. soluble	v. soluble	v. soluble alcohol.....	[crystals

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Potassium** sulphite	$K_2SO_3.2H_2O$	194.30	....	decomp.
2	" acid	$KHSO_3$	120.18	....	decomp.
3	sulphocyanate	KCNS	97.18	1.906	172.3°
4	tartrate	$K_2C_4H_4O_6.\frac{1}{2}H_2O$	235.24	1.975	....
5	" acid	$KHC_4H_4O_6$	188.14	1.956	....
6	tellurate	$K_2TeO_4.5H_2O$	359.78	....	....
7	tellurite	K_2TeO_3	253.70	....	red heat
8	thioantimonate	$2K_3SbS_4.9H_2O$	893.70	....	....
9	thioarsenate	K_3AsS_4	320.54	....	decomp.
10	thioarsenite	K_3AsS_3	288.47	....	decomp.
11	thiocarbonate	K_2CS_3	186.41	....	....
12	thionate di-	$K_2S_2O_6$	238.34	2.278^{20}_{4}	decomp.
13	" tri-	$K_2S_3O_6$	270.41	2.304^{20}_{4}	....
14	" tetra-	$K_2S_4O_6$	302.48	2.2963^{20}_{4}	....
15	" penta-	$2K_2S_5O_6.3H_2O$	723.15	2.1123^{20}_{4}	decomp.
16	thioplatinate	$K_2Pt_4S_6$	1051.5	$6.44^{15°}$	burns
17	thiostannate	$K_2SnS_3.10H_2O$	473.57	....	$10H_2O$,100
18	thiosulphate	$3K_2S_2O_3.H_2O$	589.04	*2.590	H_2O, 180°
19	tungstate ortho-	$K_2WO_4.2H_2O$	362.23	....	red heat
20	" meta-	$K_2W_4O_{13}.8H_2O$	1166.3	....	....
21	" para-	$K_6W_7O_{24}.6H_2O$	2014.7	....	decomp.
22	uranate	K_2UO_4	380.70	....	....
23	xanthogenate	$KS_2COC_2H_5$	160.28	$1.5576^{21.5°}$	dec. > 200
24	**Praseodymium**	Pr	140.61	6.4754	940°
25	am. sulphate	$Pr_2(SO_4)_3.(NH_4)_2SO_4.8H_2O$	749.62	$2.531^{16.5°}$	$8H_2O$,170°
26	bromate	$Pr_2(BrO_3)_6.18H_2O$	1373.008	....	56.5°
27	carbide	PrC_2	164.61	5.10	decomp.
28	carbonate	$Pr_2(CO_3)_3.8H_2O$	509.33	....	$6H_2O$,100°
29	chloride	$PrCl_3$	246.98	4.017^{18}_{4}	818°
30	"	$PrCl_3.7H_2O$	373.09	$2.251^{16.2°}$	....
31	oxalate	$Pr_2(C_2O_4)_3.10H_2O$	725.36	....	....
32	oxide tri-	Pr_2O_3	329.2	7.068^{20}_{4}	....
33	" tetra-	Pr_2O_4	345.2	5.978^{20}_{4}	....
34	" per-	Pr_2O_5	361.2	....	....
35	potassium sulphate	$Pr_2(SO_4)_3.3K_2SO_4.H_2O$	1146.3	$3.275^{16°}$	....
36	sulphide	Pr_2S_3	377.41	$5.042^{11°}$	decomp.
37	sulphate	$Pr_2(SO_4)_3$	569.41	$3.72^{16°}$	....
38	"	$Pr_2(SO_4)_3.8H_2O$	713.54	$2.82^{13.2°}$	....
39	**Radium**	Ra	226.4	....	700°

* Anhydrous.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	100	v. soluble	s. soluble alcohol......	monoclinic.....
2	....	soluble	soluble	insoluble alcohol.......	needles........
3	dec. 500°...	$177.2^{0°}$	$217^{20°}$	soluble alcohol, acetone	prisms........
4	....	$133^{2°}$	$158^{23°}$	s. soluble alcohol......	monoclinic.....
5	....	$0.37^{0°}$	$6.1^{100°}$	insol. al., $H.C_2H_3O_2$; sol. a., alk.	rhombic.......
6	....	s. soluble	soluble	insol. al.; s. sol. KOH..	rhomb. prisms .
7	....	s. soluble	soluble	....	....
8	....	soluble	....	insoluble alcohol......	yellow crystals.
9	....	v. soluble	....	insoluble alcohol......	crystalline.....
10	....	soluble	....	insoluble alcohol.......	....
11	....	v. soluble	....	s. soluble alcohol......	red br. crystals.
12	....	6	$66^{100°}$	insoluble alcohol.......	hexagonal.....
13	....	v. soluble	decomp.	insoluble alcohol......	rhombic needles
14	....	v. soluble	....	insoluble alcohol......	hexag. prisms..
15	....	50	decomp.	insoluble alcohol......	rhombic plates.
16	....	insoluble	....	decomp. by HCl.......	blue gray crys..
17	....	soluble	....	insoluble alcohol.......	dark brown oil.
18	decomp.	$96.1^{0°}$	$312^{90°}$	insoluble alcohol......	monoclinic.....
19	....	51.5	151.5	insoluble alcohol.......	triclinic needles
20	....	soluble	v. soluble	....	octahedra......
21	....	2.15	6.6	insoluble alcohol......	rhombic[rhomb.
22	....	insoluble	insoluble	v. soluble acids........	orange yellow
23	200°	v. soluble	....	20 alcohol; insol. ether	prisms........
24	....	decomp.	....	....	yellow........
25	....	s. soluble	....	....	crystalline..... [prisms
26	$14H_2O$, 100°	$190^{25°}$	....	....	green hexag.
27	....	decomp.	decomp.	sol. dil. a., conc. H_2SO_4	yellow crystals.
28	....	insoluble	....	sol. acids.............	crystalline.....
29	....	$69.5^{13°}$	v. soluble	sol. al. pyr. insol. $CHCl_3$	green needles..
30	....	176.5......	v. soluble	soluble HCl...........	green crystals..
31	....	$0.098^{25°}$	....	sol. conc. acids........	crystalline.....
32	....	....	....	....	greenish yellow.
33	....	....	....	....	black.........
34	....	....	....	....	....
35	....	s. soluble	....	sol. HNO_3, HCl.......	crystalline.....
36	....	insoluble	decomp.	soluble dil. acids.......	brown.........
37	....	$23.64^{0°}$	$1.01^{100°}$...	....	....
38	....	....	....	....	crystalline.....
39	....	....	....	....	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Radium** bromide	$RaBr_2$	386.24		subl. 900°
2	chloride	$RaCl_2$	296.9		1650°
3	**Rhodium**	Rh	102.9	12.1	1970°
4	chloride	$RhCl_3$	209.28		*
5	"	$RhCl_3.4H_2O$	281.34		
6	hydrosulphide	$Rh(SH)_3$	202.13		
7	hydroxide tetra-	$Rh(OH)_4$	170.93		
8	" sesqui-	$Rh(OH)_3$	153.92		decomp.
9	nitrate	$Rh(NO_3)_3.2H_2O$	324.96		
10	oxide mon-	RhO	118.90		
11	" sesqui-	Rh_2O_3	253.80		
12	" di-	RhO_2	134.90		
13	sulphate	$Rh_2(SO_4)_3.12H_2O$	710.20		
14	sulphide mono-	RhS	134.97		decomp.
15	" sesqui-	Rh_2S_3	302.01		
16	sulphite	$Rh_2(SO_3)_3.6H_2O$	554.11		
17	**Rubidium**	Rb	85.45	$1.532^{20°}$	38.5°
18	bromide	RbBr	165.37	$3.210^{23°}$	683°
19	carbonate	Rb_2CO_3	230.90		837°
20	" bi-	$RbHCO_3$	146.458		dec. 175°
21	chlorate	$RbClO_3$	168.91		
22	chloride	RbCl	120.91	$2.706^{23°}$	726°
23	chloroplatinate	Rb_2PtCl_6	578.66	$3.94^{17.5°}$	
24	chromate	Rb_2CrO_4	286.90	3.518	
25	dichromate	$Rb_2Cr_2O_7$	386.90		
26	fluoride	RbF	104.45	$3.202^{16.5°}$	753°
27	fluosilicate	Rb_2SiF_6	313.20	$3.338^{20°}$	
28	hydride	RbH	86.46	2	decomp.
29	hydroxide	RbOH	102.46	$3.203^{11°}$	301°
30	iodide	RbI	212.37	$3.428^{24°}$	642°
31	iodate	$RbIO_3$	260.37	4.559^{14}_{4}	
32	nitrate	$RbNO_3$	147.46	$3.131^{15°}$	
33	oxide mon-	Rb_2O	186.90	3.72^{0}_{0}	
34	" di-	Rb_2O_2	202.90	$3.65^{0°}$	600°
35	" tri-	Rb_2O_3	218.90	$3.53^{0°}$	<500°
36	" tetr-	Rb_2O_4	234.90		600°–650°
37	pentasulphide	Rb_2S_5	331.25	$2.618^{15°}$	223°–224°
38	perchlorate	$RbClO_4$	184.91	3.014	fusible
39	periodate	$RbIO_4$	276.37	3.918^{16}_{4}	
40	permanganate	$RbMnO_4$	204.38	$3.235^{10.4°}$	
41	sulphate	Rb_2SO_4	266.97	3.6113^{20}_{4}	

* Decomposes at 450°–500°.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	....	soluble	soluble	soluble alcohol........	....
2	....	....	....	....	yellowish reg..
3	....	insoluble	insoluble	s. sol. a., aqua regia....	grayish white
4	....	insoluble	....	insoluble acids........	red..........
5	....	v. soluble	....	sol. al., HCl; insol. ether	dark red.....
6	....	insoluble	decomp.	insol. a., Na_2S; sol. aq. r.	brownish black
7	....	insoluble	....	soluble HCl...........	green........
8	....	insoluble	....	soluble acids, KOH....	black gelatin's
9	....	soluble	soluble	insoluble alcohol.......	red..........
10	....	insoluble	insoluble	insoluble acids........	gray.........
11	....	insoluble	insoluble	insol. acids, KOH	gray crystals..
12	....	insoluble	insoluble	insol. acids, KOH	brown........
13	....	v. soluble	decomp.	insoluble alcohol......	pale yel. cryst.
14	....	insoluble	insoluble	insol. acids, aqua regia.	bluish........
15	....	insoluble	insoluble	insoluble............	black tablets..
16	....	soluble	....	insoluble alcohol.......	yellow crystals
17	696°	decomp.	decomp.	soluble acids, alcohol...	soft white....
18	....	$98^{5°}$	$205.2^{113.5°}$	....	regular.......
19	†	$450^{20°}$	soluble	soluble alcohol........	....
20	....	116.1	....	soluble alcohol........	rhombic prisms
21	....	$2.8^{4.7°}$	$5.1^{19°}$	....	trimetric.....
22	....	$76.38^{1°}$	$138.9^{100°}$	soluble alcohol........	regular.......
23	....	$0.184^{0°}$	$0.634^{100°}$	insoluble alcohol.......	yellow regular.
24	....	$62^{0°}$	$95.7^{60°}$	....	yellow rhombic
25	....	$5.72^{18°}$	$38.9^{65°}$	....	tricl.or monocl.
26	....	$22.7^{13°}$	....	insoluble al., ether.....	....
27	....	$0.16^{20°}$	$1.35^{100°}$	insoluble alcohol; sol. a.	regular.......
28	....	decomp.	decomp.	decomp. acids.........	prismatic need.
29	....	$198^{30°}$	v. soluble	soluble alcohol........	gray.........
30	....	$137.5^{6.9°}$	$152^{17.4°}$	....	reg. octahed.
31	....	$2.1^{23°}$	....	....	crystals......
32	....	$20.1^{0°}$	$452^{100°}$	v. soluble HNO_3.......	reg. or hexag. prisms
33	....	soluble	....	....	yellow octahed.
34	....	....	....	....	yellow needles
35	....	sol. decomp.	....	....	black........
36	....	....	....	....	yellow.......
37	....	decomp.	....	soluble alcohol........	red rhombic ..
38	decomp.	$1.09^{21.3°}$	....	insoluble alcohol.......	rhombic......
39	....	$0.65^{13°}$	....	....	tetragonal....
40	....	$0.46^{0°}$	$4.68^{60°}$	....	crystalline....
41	....	$36.4^{0°}$	$81.8^{100°}$	....	hexagonal....

† Decomposes at 740°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Rubidium** sulphide	$Rb_2S.4H_2O$	275.03	....	....
2	tartrate acid	$RbHC_4H_4O_6$	234.49	2.399	decomp.
3	**Ruthenium**	Ru	101.7	8.6	>1950°
4	"	Ru	101.7	11.4	2000°+
5	"	Ru	101.7	12.26^{0}_{0}	2000°+
6	chloride di-	$RuCl_2$	172.62	....	....
7	" tri-	$RuCl_3$	208.08	....	....
8	" tetra-	$RuCl_4$	243.54	....	....
9	hydroxide (sesqui-)	$Ru(OH)_3$	192.82	....	....
10	oxide sesqui-	Ru_2O_3	331.60	....	....
11	" di-	RuO_2	173.80	7.2	....
12	" penta-	Ru_2O_5	363.60	....	½O, 360°
13	" non-	Ru_4O_9	711.20	....	O, 440°
14	" tetr-	RuO_4	165.70	5.7	50°
15	silicide	RuSi	130.0	$5.40^{4°}$	....
16	**Samarium**	Sm	150.4	7.7–7.8	1350°
17	bromate	$Sm_2(BrO_3)_6.18H_2O$	1410.608	....	75°
18	bromide	$SmBr_3.6H_2O$	498.26	$2.97^{22°}$	....
19	carbide	SmC_2	174.4	5.86	....
20	chloride	$SmCl_3$	208.18	4.465^{18}_{4}	686°
21	"	$SmCl_3.3H_2O$	310.83	$2.392^{15°}$	....
22	fluoride	$SmF_3.\frac{1}{2}H_2O$	216.41	....	....
23	hydroxide	$Sm_2(OH)_6$	402.85	....	....
24	nitrate	$Sm(NO_3)_3.6H_2O$	444.53	2.375	....
25	oxide	Sm_2O_3	348.80	8.347	....
26	peroxide	Sm_4O_9	745.60	....	....
27	sulphate	$Sm_2(SO_4)_3.8H_2O$	733.14	2.930	$8H_2O$, 450
28	**Scandium**	Sc	44.1	....	1200°
29	chloride	$ScCl_3$	150.48	....	subl. 800–850°
30	oxide	Sc_2O_3	136.2	3.864	....
31	sulphate	$Sc_2(SO_4)_3$	376.41	2.579	....
32	**Selenium**	Se_8	633.6	$4.26–4.28^{25°}$	softens 50°
33	"	Se_8	633.6	$4.47^{25°}$	170°–180°
34	"	Se_8	633.6	$4.8^{25°}$	217°
35	bromide mono-	Se_2Br_2	318.24	$3.604^{15°}$	....
36	" tetra-	$SeBr_4$	398.88	....	dec. 75°
37	bromochloride tri-	$SeBr_3Cl$	354.42	....	decomp.
38	bromtrichloride	$SeBrCl_3$	265.50	....	dec. 190°
39	chloride mono-	$SeCl_2$	229.32	$2.906^{17.5°}$	....
40	" tetra-	$SeCl_4$	221.04	....	sublimes
41	iodide mono-	Se_2I_2	412.24	....	68°–70°
42	" tetra-	SeI_4	586.88	....	75°–80°
43	oxide di-	SeO_2	111.20	$3.9518^{15.3}_{15.3}$	390°

* Decomposes at 106°. † $18H_2O$ lost on heating to 150°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	v. soluble	v. soluble	....	crystals.......
2	....	$1.18^{25°}$	$11.7^{100°}$	....	trimet. prisms..
3	....	insoluble	insoluble	s. sol. a., aqua regia....	black porous...
4	....	insoluble	insoluble	....	melted........
5	....	insoluble	insoluble	....	grayish cryst...
6	....	insoluble	....	insol. acids, alkalies....	black cryst.....
7	....	soluble	decomp.	s. sol. al.; insol. a., CS_2.	brown cryst....
8	....	soluble	....	soluble alcohol [NaOH..	....
9	....	....	....	sol. a. NH_3 aq.; insol.	black powder..
10	....	insoluble	....	insoluble acids........	blue black.....
11	....	insoluble	....	insol. a.; sol. fused KOH	dark violet reg..
12	....	....	....	soluble HCl..........	black cryst.....
13	....	....	....	....	black cryst.....
14	*	s. soluble	....	soluble alkalies.......	yellow rhombic.
15	....	insoluble	insoluble.	soluble HNO_3+ HF....	metallic prisms.
16	....	....	....	....	....
17	$14H_2O, 100°$†	$114^{25°}$	....	....	yel. hex. prisms
18	....	deliques.	....	....	....
19	....	decomp.	decomp.	soluble acids.........	yellow hexag...
20	....	....	....	sol. ab. al., pyr.......	green yel. cryst.
21	....	deliques.	....	....	green.........
22	....	insoluble	....	insoluble acids........	....
23	....	insoluble	....	sol. a.; insol. alkalies...	....
24	....	v. soluble	....	....	pale yel. prisms
25	....	....	....	v. soluble in acids.....	....
26	....	insoluble	....	....	....
27	‡	s. soluble	....	....	....
28	....	....	....	....	....
29	....	v. soluble	....	insol. ab. alcohol......	shining plates..
30	....	insoluble	....	soluble hot conc. acids.	white powder..
31	....	....	....	....	....
32	690°	insoluble	insoluble	sol. CS_2, conc. H_2SO_4...	red powder....
33	690°	insoluble	insoluble	sol. CS_2, conc. H_2SO_4...	red monoclinic.
34	690°	insoluble	insoluble	insol. CS_2; sol. conc. H_2SO_4	steel-gray hex..
35	225°–230°	insoluble	decomp.	sol. CS_2, $CHCl_3$, Et. Br.	bright red liquid
36	....	decomp.	....	sol. CS_2, $CHCl_3$, Et. Br.	orange crystals.
37	....	....	....	s. soluble CS_2........	orange crystals.
38	....	....	....	insoluble CS_2..........	yel.-brown crys.
39	145°	decomposes	....	v. sol. CS_2, $CHCl_3$, CCl_4.	red liquid.....
40	....	decomposes	....	s. sol. CS_2; sol. $POCl_3$..	yel. crystalline.
41	§	decomp.	decomp.	....	steel gray cryst.
42	I_4, 100°	decomp.	decomp.	................[tone	dark gray cryst.
43	¶..........	$38.4^{14°}$	v. soluble	v. sol. al., $HC_2H_3O_2$, ace-	tetrag. needles.

‡ Loses $3SO_3$ at 1050°. § Decomp. at 100°. ¶ Sublimes at 250°–280°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Selenium** oxychloride	$SeOCl_2$	166.12	2.44	10°
2	nitride	Se_2N_2	186.42	....	exp. 200°
3	sulphide	SeS	111.27	$3.056^{0°}$	decomp.
4	sulphoxide	$SeSO_3$	159.27	....	dec. 40°
5	sulphoxytetra-chloride	$SeSO_3Cl_4$	301.11	....	165°
6	**Selenic acid**	H_2SeO_4	145.22	$2.9508^{15°}$	58°
7	" "	$H_2SeO_4.H_2O$	163.24	$2.6273^{15°}$	25°
8	**Selenious acid**	H_2SeO_3	129.22	$3.0066^{15.7°}$	decomp.
9	**Silicic acid** meta-	H_2SiO_3	78.32	$1.813^{17°}$	....
10	" " ortho-	H_4SiO_4	96.33	$1.576^{170°}$	....
11	**Silicobromoform**	$SiHBr_3$	269.10	2.7	> −60°
12	**Silicochloroform**	$SiHCl_3$	135.69	1.65	−1.34°
13	**Silicofluoform**	$SiHF_3$	86.31	$2.98^{0°}$ D.	−110°
14	**Silicoiodoform**	$SiHI_3$	410.07	$3.314^{20°}$	....
15	**Silicon** cryst	Si	28.3	$2.49^{10°}$	1420°
16	graphitic	Si	28.3	2.00–2.50	....
17	amorphous	Si	28.3	2.00	....
18	boride tri-	SiB_3	61.3	2.52	....
19	" hexa-	SiB_6	94.3	2.47	....
20	bromide tri-	$SiBr_3$	268.06	....	95°
21	" tetra-	$SiBr_4$	347.98	2.8128^{0}_{0}	5°
22	bromotrichloride	$SiBrCl_3$	214.60	....	....
23	dibromdichloride	$SiBr_2Cl_2$	259.11	....	> −60°
24	tribromchloride	$SiBr_3Cl$	303.52	2.432	> −39°
25	carbide	SiC	40.30	$3.12^{15°}$	....
26	chloride tri-	$SiCl_3$	134.68	$1.58^{0°}$	−1°
27	" tetra-	$SiCl_4$	170.14	1.524^{0}_{4}	−89°
28	chlorohydrosulphide	$SiCl_3SH$	167.76	1.45	....
29	fluoride	SiF_4	104.30	3.57 A.	−77°
30	hydride	SiH_4	32.33	....	....
31	"	Si_2H_6	62.65	2.37 D.	−138°
32	iodide di-	SiI_2	282.14	....	....
33	" hexa-	Si_2I_6	818.22	....	250°(vac.)
34	" tetra-	SiI_4	535.98	18.56 A.	120.5°
35	iodoform	$SiHI_3$	410.068	$3.286^{23°}$	8°
36	iodotrichloride	$SiICl_3$	261.60	....	....
37	oxide di- amorph.	SiO_2	60.30	$2.20^{15.6°}$	1600°–
38	" " cryst.	SiO_2	60.30	2.318–2.654	1750°
39	oxychloride	Si_2OCl_6	301.36	10.05 D.	....

* At 181 cm.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	179.5°	decomp.	....	....	yellowish liquid
2	....	insoluble	insoluble	insol. al.; s. sol. CS_2....	orange yellow.
3	....	insoluble	insoluble	sol. CS_2; insol. ether...	or. yel. tablets.
4	....	decomposes	....	sol. conc. H_2SO_4......	green prisms..
5	183°	decomposes	....	....	white needles.
6	260°	v. soluble	....	sol.conc.H_2SO_4; dec. al.	hexag. prisms.
7	....	v. soluble	....	....	needles.......
8	....	v. soluble	v. soluble	v. soluble alcohol	crystals......
9	....	insoluble	....	sol. alk.; insol. NH_4Cl..	amorphous ...
10	....	s. soluble	....	sol. alk.; insol. NH_4Cl..	amorphous ...
11	109°–110°	decomposes	....	....	....
12	34°	decomposes	....	sol. CS_2, $CHCl_3$, CCl_4...	....
13	−80.2°	decomposes	....	dec. alk., al., ether; sol. toluol.	....
14	220°	decomposes	....	sol. CS_2........ [+ HF	liquid........
15	3500°	insoluble	insoluble	insol. HF; sol. HNO_3	gray octahed..
16	3500°	insoluble	insoluble	insol. HF; sol. HNO_3 + HF, fused KOH	crystalline....
17	3500°	insoluble	insoluble	sol. HF, KOH........	brown amorph.
18	....	insoluble		s. sol. hot conc. H_2SO_4,	black rhombic
19	....	insoluble	....	conc. HNO_3	black crystals.
20	265°	decomposes	....	decomp. by KOH	rhombic......
21	153°	decomposes	decomp.	decomp. by H_2SO_4.....	....
22	80°	decomposes	....	....	....
23	103°–105°	decomposes	....	....	....
24	126°–128°	decomposes	....	....	....
25	....	insoluble	insoluble	insoluble acids........	rhombic plates
26	144°–148°	decomposes	decomposes	decomp. by alkalies....	leaflets.......
27	59.6°	decomposes	....	decomp. by alcohol....	yellow.......
28	96°	decomposes	....	decomp. by alcohol....	....
29	−65° *	decomposes	....	sol. al., ether, HNO_3...	gas.........
30	−115.5°	insoluble	....	decomp. by KOH	....
31	52°	decomposes	....	....	liquid........
32	....	decomposes	....	insol., CS_2, $CHCl_3$, C_6H_6.	....
33	decomp.	decomposes	decomposes	19, CS_2..............	hexag. plates.
34	290°	decomposes	....	$2.2^{27°}$, CS_2...........	reg. octahedra.
35	dec. 150°	....	....	sol. ∞ benzol and CS_2.	....
36	113°–114°	decomposes	....	....	....
37	†........	insoluble	....	sol. hot. alk., HF.....	amorphous ...
38	....	insoluble	....	insol. alk.; sol. HF.....	hexag. prisms.
39	136°–139°	decomposes	....	sol.CS_2,$CHCl_3$,CCl_4, ether	....

† Sublimes at 1750°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Silicon** sulphide	SiS_2	92.44	....	....
2	sulphobromide	$SiSBr_2$	220.21	....	93°
3	sulphochloride	$SiSCl_2$	70.83	....	75°
4	**Silver**	Ag	107.88	10.53	961.5°
5	"	Ag	107.88	....	955° in air
6	acetate	$AgC_2H_3O_2$	166.90	3.259	decomp.
7	arsenate	Ag_3AsO_4	462.60	$6.66^{25°}_{4}$	fusible
8	arsenite	Ag_3AsO_3	446.60	....	decomp.
9	bromate	$AgBrO_3$	235.80	5.206	decomp.
10	bromide	AgBr	187.80	6.473^{25}_{4}	427°
11	carbonate	Ag_2CO_3	275.76	$6.0^{17.5°}$	dec. 200°
12	chlorate	$AgClO_3$	191.29	$4.401^{23°}$	230°
13	chloride	AgCl	143.34	5.561	451°
14	chromate	Ag_2CrO_4	331.76	5.523	....
15	citrate	$AgC_6H_5O_7$	296.92	....	decomp.
16	cyanate	AgCNO	149.89	4.0	decomp.
17	cyanide	AgCN	133.89	3.95	decomp.
18	dichromate	$Ag_2Cr_2O_7$	431.76	....	decomp.
19	ferricyanide	Ag_3FeCy_6	535.54	....	....
20	ferrocyanide	$Ag_4FeCy_6.H_2O$	661.44	....	....
21	fluoride	AgF	126.88	$5.852^{15.5°}$	435°
22	fluosilicate	$Ag_2SiF_6.2H_2O$	394.09	....	<100°
23	iodate	$AgIO_3$	282.80	5.4–5.65	decomp.
24	iodide	AgI	234.80	5.675^{25}_{4}	526°–556°
25	nitrate	$AgNO_3$	169.89	$4.352^{19°}$	218°
26	nitrite	$AgNO_2$	153.89	$4.453^{25°}$	....
27	nitroprusside	$Ag_2Fe(CN)_5NO$	671.66	....	....
28	oxalate	$Ag_2C_2O_4$	303.76	$5.029^{4°}$	decomp.
29	oxide	Ag_2O	231.76	7.521	O,300–340
30	oxide per-	AgO	123.88	5.474	dec. >100°
31	perchlorate	$AgClO_4$	207.32	....	486°
32	permanganate	$AgMnO_4$	225.81	....	decomp.

* At 22.5 mm.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	white heat	decomposes	....	sol. dil. alk.; dec. by al..	needles.......
2	150°	decomposes	decomposes	soluble CS_2...........	plates........
3	92° *	decomposes	decomposes	soluble CS_2...........	prisms.......
4	1955°	insoluble	insoluble	sol. HNO_3, hot conc.	....
5	1955°	....	....	H_2SO_4; insol. alk.	
6	....	$1.02^{14°}$	$2.52^{80°}$	....	laminæ.......
7	....	$0.00085^{20°}$	....	sol. $H.C_2H_3O_2$, NH_3aq. NH_4 salts	dark red.....
8	....	$0.00115^{20°}$	insoluble	sol. $H.C_2H_3O_2$, NH_3aq. NH_4 salts	yellow........
9	....	$0.158^{20°}$	....	sol. NH_3aq.; s. sol. HNO_3	tetragonal....
10	†	$0.000026^{25°}$	$0.00014^{100°}$	$.051^{100°}$ NH_3aq.; sol. KCN	pale yel. octah.
11	....	$0.0031^{15°}$	$0.05^{100°}$	sol. NH_3aq., $Na_2S_2O_3$; insol. alcohol	....
12	‡	$10^{15°}$	$50^{80°-90°}$	insol. alcohol.....[KCN	tetrag. or reg..
13	....	$0.000152^{20°}$	$0.0022^{100°}$	sol. conc. HCl., NH_3aq.,	regular.......
14	....	$0.0028^{18°}$	....	sol. a., NH_3aq., KCN ..	dark red cryst.
15	....	$0.028^{18°}$	$0.0284^{25°}$	sol. NH_3aq., KCN.....	needles......
16	....	s. soluble	soluble	sol. HNO_3, NH_3aq., KCN	....
17	....	$0.000021^{25°}$	insoluble	sol. NH_3aq., KCN, HNO_3	white curdy...
18	....	$0.0083^{15°}$	decomp.	v. sol. HNO_3, NH_3aq., KCN	red triclinic...
19	....	$0.000066^{20°}$	....	sol. NH_3aq., hot $(NH_4)_2CO_3$ [a.	orange yellow.
20	....	insoluble	....	sol. KCN, NH_3 aq.; insol.	yellowish white
21	....	$182^{15.5°}$	....	....	yellow tetrag..
22	decomp.	v. soluble	....	....	crystals......
23	....	$0.00385^{18°}$	s. soluble	sol. HNO_3.NH_3aq., KI	monoclinic....
24	....	$0.000035^{21°}$	....	sol. KCN, $Na_2S_2O_3$, NaCl	yellow hexag.. or regular.
25	decomp.	$122^{0°}$	$940^{100°}$	66 al., ether, glycerine .	rh'b. or hexag. rhombohed.
26	....	0.33	soluble	insoluble alcohol.......	crystals......
27	....	insoluble	....	insol. al., HNO_3; sol. NH_3aq.	flesh colored..
28	....	$0.00339^{18°}$	....	sol. NH_3aq., KCN.....	white........
29	....	$0.00215^{20°}$	....	sol. NH_3aq., KCN, $Na_2S_2O_3$ [NH_3aq.	brown powder
30	....	insoluble	....	sol. conc. H_2SO_4, HNO_3,	black octahed.
31	....	soluble	....	....	....
32	....	$0.55^{0°}$	$1.69^{28.5°}$	....	monoclinic....

† Decomposes at 700°. ‡ Decomposes at 270°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Silver				
1	phosphate ortho-..	Ag_3PO_4..........	418.68	7.321	849°
2	" pyro-...	$Ag_4P_2O_7$.........	605.60	$5.306^{7.5°}$	585°
3	potassium cyanide.	$KAg(CN)_2$.......	199.00	....	....
4	selenide.........	Ag_2Se...........	294.96	8.0	red heat
5	sulphate.........	Ag_2SO_4..........	311.83	5.40	660°
6	sulphide.........	Ag_2S............	247.83	6.85–7.32	825°
7	sulphite.........	Ag_2SO_3..........	295.83	....	dec. 100°
8	sulphocyanate.....	AgCNS..........	165.96	....	....
9	tartrate.........	$Ag_2C_4H_4O_6$.......	363.79	3.4321	decomp.
10	telluride.........	Ag_2Te...........	343.26	8.318	955°
11	trinitride........	AgN_3...........	149.91	....	250°
12	tungstate........	Ag_2WO_4.........	463.76	....	< redness
13	Sodium...........	Na.............	23.00	$0.9735^{13.5°}$	97.6°
14	acetate..........	$NaC_2H_3O_2.3H_2O$....	136.7	1.4	58°
15	aluminate.......	$Na_2Al_2O_4$........	164.2	....	1800°
16	amide ......[phate	$NaNH_2$..........	40.03	....	155°
17	ammonium phos-	$NaNH_4HPO_4.4H_2O$	209.15	1.554	decomp.
18	antimonate.......	$2NaSbO_3.7H_2O$....	508.51	....	....
19	" pyro-..	$Na_2H_2Sb_2O_7.H_2O$...	418.43	....	....
20	arsenate.........	$Na_3AsO_4.12H_2O$...	424.15	1.7593	85.5°
21	" acid.....	$Na_2HAsO_4.7H_2O$...	312.08	....	57°
22	" acid.....	$Na_2HAsO_4.12H_2O$..	402.16	1.67–1.76	28°
23	arsenite.........	Na_2HAsO_3.......	169.97	1.87	....
24	aurosulphide.....	$NaAuS.4H_2O$.....	324.33	....	....
25	benzoate	$NaC_7H_5O_2$........	144.040	....	....
26	borate meta-......	$NaBO_2$...........	66.00	....	966°
27	" tetra-......	$Na_2B_4O_7$.........	202.00	2.367	878°
28	" "	$Na_2B_4O_7.5H_2O$.....	292.08	1.815	....
29	" " borax.	$Na_2B_4O_7.10H_2O$ ...	382.16	$1.694^{17°}$	red heat
30	" meta-......	$Na_2B_2O_4.4H_2O$.....	204.06	....	57°
31	bromate.........	$NaBrO_3$..........	150.92	$3.339\frac{17.5}{17.5}$	381°
32	bromide.........	NaBr...........	102.92	2.95–3.08	757.7°
33	"	$NaBr.2H_2O$.......	138.95	2.176^{20}_{4}	....
34	bromplatinate.....	$Na_2PtBr_6.6H_2O$....	828.82	3.323	decomp.
35	carbide..........	Na_2C_2...........	70.00	$1.575^{15°}$	....
36	carbonate........	Na_2CO_3..........	106.00	2.43–2.51	849°
37	"	$Na_2CO_3.H_2O$......	124.016	....	H_2O, 100°
38	"	$Na_2CO_3.10H_2O$....	286.16	$1.446^{17°}$	† 34°
39	" acid....	$NaHCO_3$..........	84.01	2.19–2.22	‡

* Loses $7H_2O$ at 100°. ** Loses $12H_2O$ at 100°. † Loses $5H_2O$ at 12.5°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	$0.00193^{20°}$	....	sol. acids, NH_3aq., KCN	yellow ....
2	....	insoluble	insoluble	sol. NH_3aq., HNO_3, H_2SO_4, KCN	....
3	....	$25^{20°}$	v. soluble. .	4 alcohol; insol. acids. .	reg. octahedra.
4	....	insoluble	....	sol. conc. hot HNO_3, NH_3aq.	gray. ....
5	dec. 1085°	$0.73^{14.5°}$	$1.393^{100°}$	sol. H_2SO_4, HNO_3, NH_3. aq.; insol. al.	rhombic. ...... [or triclinic
6	oxidizes	0.00002	....	sol. conc. H_2SO_4, HNO_3	gray black reg.
7	....	s. soluble	....	sol. NH_3aq.; insol. HNO_3	crystals ....
8	....	$.000021^{25°}$	$0.00023^{100°}$	insol. dil. a.; sol. NH_3aq	curdy.........
9	....	$0.2^{18°}$	$0.203^{25°}$	soluble NH_3aq., KCN. .	scales.........
10	....	insoluble	....	sol. warm HNO_3, KCN.	gray octahedra.
11	explodes	insoluble	$.01^{100°}$	sol. dil. HNO_3, conc. a. .	prisms........
12	....	$.05^{15°}$	....	sol. HNO_3,NH_3aq.,KCN	pale yel. cryst. .
13	877.5°	decomp.	decomp.	insol. benzol., kero.;	....
14	....	$26^{6°}$	200	sol. al. $2.1^{18°}$....[sol. a.	monocl. prisms.
15	....	soluble	v. soluble	insoluble alcohol	amorphous ....
16	400°	decomposes	decomposes	....	olive green ....
17	....	16.7	100	insoluble alcohol.......	monoclinic.....
18	....	$.031^{12.3°}$	....	s. sol. al., NH_4 salts.....	octahedra.....
19	....	s. soluble	s. soluble	s. soluble alcohol......	....
20	....	$26.7^{17°}$	....	....	....
21	*	$61^{15°}$	v. soluble	s. sol. alcohol..........	crystalline.....
22	**	$17.2^{0°}$	$140.7^{30°}$	insoluble alcohol.......	mono. or rhom. .
23	....	v. soluble	s. soluble	....	....
24	....	soluble	....	soluble alcohol........	monoclinic.....
25	....	$62.5^{25°}$	$76.9^{100°}$	$2.3^{25°}$, $8.3^{78°}$ al........	crystalline.....
26	....	soluble	v. soluble	....	hexag. prisms. .
27	....	$1.3^{5°}$	$52.5^{100°}$	insoluble alcohol	....
28	....	$1.9^{5°}$	$99.1^{100°}$	....	octahedral.....
29	....	$2.83^{0°}$	$201.4^{100°}$	insol. a.; sol. glycerine. .	monoclinic.....
30	....	soluble	v. soluble	....	monoclinic.....
31	....	$27.54^{0°}$	$90.9^{100°}$	insol. alcohol..........	§
32	....	$79.5^{0°}$	$114.9^{100°}$	s. soluble alcohol......	regular........
33	....	$172.5^{0°}$	$259.5^{100°}$	....	....
34	....	v. soluble	....	v. soluble alcohol......	dark red triclin.
35	700°	decomp.	decomp.	sol. acids; decomp. al. . .	powder........
36	decomp.	$7.1^{0°}$	$45.4^{100°}$	insoluble alcohol.......	....
37	....	....	....	insol. al. ether, sol. glyc.	crystalline.....
38	106°	$21.33^{0°}$	$1142^{38°}$	insoluble alcohol.......	monoclinic.....
39	....	$6.90^{0°}$	$16.40^{60°}$	insoluble alcohol.......	monoclinic.....

‡ Loses CO_2 at 270°. § Reg. tetrah. hex. rhomboh. or rhomb.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Sodium				
1	carbonate sesqui-	$Na_4H_2(CO_3)_3.3H_2O$	328.06	2.112	decomp.
2	chlorate	$NaClO_3$	106.46	$2.490^{15°}$	255°
3	chloraurate	$NaAuCl_4.2H_2O$	398.07	....	....
4	chloride	$NaCl$	58.46	2.1741^{20}_{4}	804°
5	chlororhodate	Na_3RhCl_6	384.66	....	....
6	chloriridate	$Na_2IrCl_6.6H_2O$	559.96	....	....
7	chloroplatinate	$Na_2PtCl_6.6H_2O$	561.86	2.499	$6H_2O$, 100
8	chromate	$Na_2CrO_4.10H_2O$	342.16	$2.71^{16°}$	19.92°
9	citrate	$2Na_3C_6H_5O_7.11H_2O$	714.256	....	$11H_2O$, 150°
10	cyanide	$NaCN$	49.01	....	....
11	dichromate	$Na_2Cr_2O_7.2H_2O$	298.03	$2.52^{16°}$	†
12	dithionate	$Na_2S_2O_6.2H_2O$	242.17	$2.175^{11°}$	....
13	ferricyanide	$Na_3Fe(CN)_6.H_2O$	298.92	....	....
14	ferric oxalate	$Na_3Fe(C_2O_4)_3.5\frac{1}{2}H_2O$	487.93	$1.9731^{17.5°}$	$4H_2O$, 100
15	ferrite	$Na_2Fe_2O_4$	221.68	....	....
16	ferrocyanide	$Na_4Fe(CN)_6.12H_2O$	520.09	1.458	....
17	fluoride	NaF	42.00	2.766	980°
18	fluosilicate	Na_2SiF_6	188.30	$2.755^{17.5°}$	¶
19	formate	$NaCHO_2$	68.01	1.919	decomp.
20	hydride	NaH	24.01	0.92	decomp.
21	hydrosulphide	$NaSH.2H_2O$	92.11	....	decomp.
22	hydroxide	$NaOH$	40.01	2.13	318°
23	hypochlorite	$NaOCl$	74.46	....	decomp.
24	hypophosphate	$Na_4P_2O_6.10H_2O$	430.24	1.832	....
25	" acid	$Na_2H_2P_2O_6.6H_2O$	314.17	1.840	decomp.
26	hypophosphite	$NaH_2PO_2.H_2O$	106.07	....	....
27	hyposulphite	$NaHSO_2$	88.08	....	....
28	iodate	$NaIO_3$	197.92	4.277	decomp.
29	iodide	NaI	149.92	$3.654^{18.2°}$	653°
30	"	$NaI.2H_2O$	185.95	2.448	....
31	lactate	$NaC_3H_5O_3$	112.04	....	decomp.
32	manganate	$Na_2MnO_4.10H_2O$	345.09	....	17°
33	molybdate	$Na_2MoO_4.2H_2O$	242.03	....	....
34	" di-	$Na_2Mo_2O_7$	350.00	....	612°
35	" tri-	$Na_2Mo_3O_{10}.7H_2O$	620.11	....	....
36	" tetra-	$Na_2Mo_4O_{13}.6H_2O$	746.10	....	<red heat
37	" octo-	$Na_2Mo_8O_{25}.4H_2O$	1286.1	....	....
38	" deka-	$Na_2Mo_{10}O_{31}.12H_2O$	1718.2	....	....
39	nitrate	$NaNO_3$	85.01	2.267^{20}_{4}	316°
40	nitride	Na_3N	83.01	....	....
41	nitrite	$NaNO_2$	69.01	$2.157^{25°}$	213°

* Solubility of the anhydrous salt. † Loses $2H_2O$ at 100°. ‡ Decomp. at 400°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	...	$12.63^{0°}$	$41.59^{100°}$	...	monoclinic....
2	decomp.	$81.9^{0°}$	$333^{120°}$	soluble alcohol........	reg. tetrahedral
3	...	$150^{10°}$	$990^{60°}$	v. sol. absolute al......	...[hexag. rhb.
4	white heat	$35.7^{0°}$	$39^{100°}$	insol. conc. HCl.; s.sol.al	regular.......
5	...	...	...	...	...
6	...	v. soluble	v. soluble	soluble alcohol........	red triclinic...
7	...	v. soluble	v. soluble	sol.al., Cl_2aq.; insol. ether	red triclinic...
8	...	87.36*	∞	s. soluble alcohol......	yellow tricl...
9	decomp.	$91^{25°}$	$250^{100°}$	s. sol. al.............	...
10	...	soluble	v. soluble	s. soluble alcohol......	...
11	‡	$239^{0°}$	$1226^{98°}$	...	red triclinic...
12	...	$47.6^{16°}$	$90.9^{100°}$	insol. alcohol, conc. HCl	rhombic......
13	...	18.9	$80^{100°}$	insoluble alcohol.......	red..........
14	§	$32.5^{0°}$	$182^{100°}$	...	green crystals.
15	...	decomposes	...	v. soluble dil. HCl.....	...
16	...	$22^{15.5°}$	...	insoluble alcohol.......	yellow monocl.
17	...	$4^{15°}$	...	s. soluble alcohol......	reg.... [hexag.
18	...	$0.65^{17.5°}$	$2.46^{100°}$	insoluble alcohol.......	gelatinous or
19	...	$44^{0°}$	$160^{100°}$	s. sol. al.; insol. ether...	rhombic......
20	...	decomposes	decomp.	insol. CS_2, CCl_4, benzine;	silvery needles.
21	...	soluble	soluble	soluble alcohol [sol. Na	needles.......
22	white heat	$133.3^{18°}$	$250^{80°}$	v. sol. al., ether, glyc...	...
23	...	soluble	decomposes	...	...
24	...	33	v. soluble	...	...
25	...	2.2	20	insoluble alcohol.......	...
26	...	soluble	soluble	v. soluble alcohol......	mono. prisms .
27	...	v. soluble	...	soluble alcohol........	...
28	...	$2.52^{0°}$	$33.9^{100°}$	insol. al.; sol. $H.C_2H_3O_2$.	...
29	...	$158.7^{0°}$	$312.5^{100°}$	v. soluble alcohol......	regular.......
30	...	$317.9^{0°}$	$1550^{100°}$	...	...
31	...	v. soluble	...	sol. al.; insol. ether....	amorphous ...
32	...	soluble	decomposes	...	green monocl..
33	...	$56.2^{0°}$	$115.5^{100°}$	...	tablets.......
34	...	s. soluble	s. soluble	...	needles.......
35	...	$3.878^{20°}$	$13.7^{100°}$	...	needles.......
36	...	s. soluble	v. soluble	...	...
37	...	insoluble	insoluble	...	powder.......
38	...	s. soluble	s. soluble	...	crystalline....
39	decomp.	$72.9^{0°}$	$180^{100°}$	s. sol. alcohol, glycerene	rhombohedral.
40	...	...	...	.... [methyl al.	dark gray....
41	...	$83.3^{20°}$	v. soluble	$0.31^{19.5°}$ et. al., $4.43^{19.5°}$	crystalline....

§ Loses $5\frac{1}{2}$ H_2O at 200°. ¶ Decomposes at red heat.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Sodium nitroprusside.	$Na_2Fe(CN)_5NO.2H_2O$	297.83	$1.6803^{17°}$	....
2	oxalate..........	$Na_2C_2O_4$..........	134.00	....	....
3	" acid......	$NaHC_2O_4.H_2O$.....	130.02	....	....
4	oxide...........	Na_2O............	62.00	2.25	red heat
5	paratungstate....	$Na_6W_7O_{24}.16H_2O$...	2098.3	....	$16H_2O$,300
6	perborate........	$NaBO_3.H_2O$.......	100.02	....	dec. 40°
7	"	$NaBO_3.4H_2O$......	154.06	....	....
8	perborax........	$Na_2B_4O_7.10H_2O$	382.21	....	....
9	perchlorate......	$NaClO_4$...........	122.46	....	482°
10	perchromate.....	Na_3CrO_8..........	249.00	....	dec. 115°
11	permanganate....	$NaMnO_4.3H_2O$.....	196.00	....	decomp.
12	peroxide.........	Na_2O_2............	78.00	2.805	decomp.
13	perruthenate.....	$NaRuO_4.H_2O$......	206.72	....	....
14	peruranate.......	$Na_2UO_5.5H_2O$.....	454.58	....	dec. 100°
15	phosphate (trisod.)	$Na_3PO_4.12H_2O$....	380.23	1.618–1.645	77°
16	" (disod.)	$Na_2HPO_4.12H_2O$....	358.24	$1.5235^{16°}$	35°
17	" (mono-)	$NaH_2PO_4.H_2O$.....	138.07	2.040	$2H_2O$,200°
18	" meta-..	$Na_4P_4O_{12}$.........	408.16	2.476	617°
19	" pyro-...	$Na_4P_2O_7.10H_2O$	446.24	1.824	anh. 970°
20	" " (di-sodium)	$Na_2H_2P_2O_7.6H_2O$....	330.19	1.848	....
21	phosphite.........	$Na_2HPO_3.5H_2O$....	216.17	....	53°
22	" acid....	$2NaH_2PO_3.5H_2O$....	298.19	....	42°
23	platinate........	$Na_2PtO_3.3H_2O$....	343.25	....	¶
24	potass. carbonate..	$NaKCO_3.6H_2O$.....	230.20	1.6334	$6H_2O$,100°
25	" tartrate ...	$NaKC_4H_4O_6.4H_2O$ ..	282.20	1.77	70°–80°
26	salicylate........	$NaC_7H_5O_3$.........	160.04	....	....
27	selenate.........	Na_2SeO_4..........	189.20	$3.209^{17.2°}$	....
28	selenide.........	Na_2Se............	125.20	....	>875°
29	silicate..........	Na_2SiO_3..........	122.30	....	1018°
30	" (water glass)	$Na_2Si_4O_9$..........	303.20	....	....
31	stannate.........	$Na_2SnO_3.3H_2O$....	267.05	....	....
32	sulphate..........	Na_2SO_4...........	142.07	2.671^{20}_{4}	888°
33	"	$Na_2SO_4.7H_2O$......	268.18	....	....
34	"	$Na_2SO_4.10H_2O$	322.23	$1.492^{20°}$	32.383°
35	" acid.....	$NaHSO_4$...........	120.08	$2.435^{13°}$	300°
36	sulphide mono-....	Na_2S.............	78.07	2.471	infusible
37	" penta-....	Na_2S_5............	206.35	....	....
38	sulphite..........	Na_2SO_3...........	126.07	$2.6334^{15°}_{4}$	150°
39	"	$Na_2SO_3.7H_2O$......	252.18	$1.5939^{15°}_{4}$	$7H_2O$,150°

* Loses $11H_2O$ at 100°. † Loses $12H_2O$ at 100°. ¶ $3H_2O$, 150°–170°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	$40^{15°}$	....	....	red triclinic....
2	....	$3.22^{15.5°}$	$6.33^{100°}$...	....	....
3	....	$1.7^{15°}$	....	....	monoclinic.....
4	sublimes	decomposes	decomposes	decomposes alcohol....	grayish........
5	....	8	decomposes	....	triclinic.......
6	....	$2.55^{15°}$	$3.78^{32°}$	soluble glycerine.......	....
7	....	s. soluble	decomp.	soluble acids..........	crystals.......
8	....	$4.2^{11°}$	$13.8^{32°}$	....	crystals.......
9	decomp.	soluble	v. soluble	soluble alcohol........	rhombohedral .
10	....	s. soluble	....	insol. alcohol, ether....	orange plates..
11	....	v. soluble	v. soluble	....	dark red cryst..
12	....	soluble	decomposes	soluble dilute acids....	yellow........
13	....	s. soluble	....	....	black crystals..
14	....	decomp.	decomp.	decomp. HCl..........	red crystals....
15	*	$28.3^{15°}$	∞	....	hexagonal.....
16	†	$6.3^{0°}$	∞	insoluble alcohol.......	rhombic.......
17	....	v. soluble	....	insoluble alcohol.......	rhombic.......
18	‡	insoluble	insoluble	soluble acids, alkalies ..	....
19	....	$5.4^{0°}$	93	insoluble alcohol......	monoclinic.....
20	....	....	....	....	....
21	....	soluble	v. soluble	insoluble alcohol......	rhombohedral..
22	§	$56^{0°}$	$193^{42°}$	....	....
23	....	soluble	....	insoluble alcohol......	yellow........
24	....	$185^{15°}$	....	....	monoclinic.....
25	‖	$26^{0°}$	$66^{26°}$	....	trimet. prisms..
26	....	v. soluble	....	....	....
27	....	$13.3^{0°}$	$72.8^{100°}$	....	....
28	....	decomposes	....	....	crystals.......
29	....	soluble	soluble	insol. al., Na and K salts	monoclinic....
30	....	soluble	soluble	insol. al., Na and K salts	amorphous....
31	....	$67.4^{0°}$	$61.3^{20°}$	insoluble alcohol.......	hexag. plates..
32	....	$4.8^{0°}$	$42.5^{100°}$	insoluble alcohol.......	rhomb monocl. or hexagonal.
33	....	$55.59^{0°}$	$202.6^{26°}$	....	rhomb. or tetr.
34	....	$12.16^{0°}$	$412^{34°}$	insoluble alcohol.......	monoclinic.....
35	....	$50^{0°}$	$100^{100°}$	decomp. by alcohol....	triclinic.......
36	....	$15.4^{10°}$	$59.2^{90°}$	s. sol. al.; insol. ether..	flesh col. amor.
37	....	soluble	soluble	s. sol. alcohol.........	....
38	decomp.	$14.1^{0°}$	$49.5^{40°}$	insoluble alcohol.....	hexag. prisms .
39	decomp.	$32.83^{0°}$	$196^{40°}$	insoluble alcohol......	monocl. prisms

‡ Decomposes at red heat. § Loses $5H_2O$ at 100°. ‖ Loses $4H_2O$ at 215°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Sodium** sulphite acid	$NaHSO_3$	104.08	1.48	decomp.
2	sulphocyanate	NaCNS	81.08		287°
3	tartrate	$Na_2C_4H_4O_6.2H_2O$	230.06	1.794	
4	thioantimonate (Schlipp's salt)	$Na_3SbS_4.9H_2O$	479.62	1.864	
5	thioarsenate	$2Na_3AsS_4.15H_2O$	814.68		
6	thiocarbonate	$Na_2CS_3.H_2O$	172.23		decomp.
7	thioplatinate	$Na_4Pt_3S_6$	870.02		
8	thiosulphate	$Na_2S_2O_3.5H_2O$ *	248.22	$1.729^{17°}$	32°–48°
9	tungstate	$Na_2WO_4.2H_2O$	330.03	$3.259^{17.5°}$	$2H_2O$,100°
10	uranate	Na_2UO_4	348.50		
11	vanadate	$Na_3VO_4.16H_2O$	472.26		866 (anh.)
12	**Stannic** acid	H_2SnO_3	169.02		
13	" " meta-	$H_{10}Sn_5O_{15}$	845.08		
14	" " thio-	H_2SnS_3	217.23		
15	ammonium chloride	$SnCl_4.(NH_4Cl)_2$	367.84		
16	bromide	$SnBr_4$	438.68	$3.349^{35°}$	29°
17	chloride	$SnCl_4$	260.84	2.2788^{0}_{4}	−33°
18	fluoride	SnF_4	195.00	4.780	750°
19	iodide	SnI_4	626.68	$4.696^{11°}$	143°
20	oxide	SnO_2	151.00	6.6–6.9	1127°
21	" cryst	SnO_2	151.00	6.7–6.85	infusible
22	oxychloride	$SnOCl_2$	205.92		
23	phosphate	$2SnO_2.P_2O_5.10H_2O$	624.32	3.98 (anh.)	
24	phosphide	SnP	151.04	6.56	
25	selenide	$SnSe_2$	277.4	4.85	
26	sulphate	$Sn(SO_4)_2.2H_2O$	347.17		
27	sulphide	SnS_2	183.14	4.42–4.60	‡
28	**Stannous** bromide	$SnBr_2$	278.84	$5.117^{17°}$	215.5°
29	chloride	$SnCl_2$	189.92		249.3°
30	" (tin salt)	$SnCl_2.2H_2O$	225.95	$2.71^{15.5°}$	37.7°
31	ferricyanide	$Sn_3(Fe(CN)_6)_2$	780.80		
32	ferrocyanide	$Sn_2Fe(CN)_6$	449.90		
33	fluoride	SnF_2	157.00		
34	hydroxide	$Sn(OH)_2$	153.02		
35	iodide	SnI_2	372.84		316°
36	oxide	SnO	135.00	6.3	decomp.
37	oxychloride	$SnOSnCl_2.6H_2O$	433.02		
38	selenide	SnSe	198.20	$6.179^{0°}$	

* M. P. anhydrous salt 698°.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.). Acids (a.), Alkalies (alk.), etc.	
1	....	s. soluble	soluble	insoluble alcohol......	....
2	....	v. soluble	v. soluble	v. soluble alcohol......	rhombic plates
3	....	$29^{6°}$	$66^{42.5°}$	insoluble alcohol.......	trimet. prisms.
4	....	33	....	insoluble alcohol......	yellow regular.
5	....	v. soluble	....	insoluble alcohol.......	yel. monoclinic
6	....	soluble	decomposes	....	yellow...[dles
7	....	insoluble	decomposes	....	red rhomb. nee-
8	decomp.	$74.7^{0°}$	$301.5^{60°}$	insoluble alcohol.[H_2SO_4	monocl. prisms
9	*..........	$41^{0°}$	$123.5^{100°}$	insol. al., HCl, HNO_3,	rhombic tablets
10	....	insoluble	insoluble	sol. dilute acids	yellow........
11	....	v. soluble	....	insoluble alcohol.......	crystalline....
12	....	s. soluble	insoluble	sol. dil. acids, alk......	amorphous ...
13	....	insoluble	insoluble	insol. acids; sol. KOH..	....
14	....	insoluble	....	....	gray.........
15	....	soluble	....	....	....
16	203°	soluble	decomp.	.................[tine	....
17	114°	soluble	decomp.	sol. al., CS_2, oil of turpen-	liquid........
18	....	v. soluble	....	....	crystals......
19	341°	v. soluble	....	$145^{15°}$ CS_2; sol. al., ether	†............
20	....	insoluble	insoluble	soluble conc. H_2SO_4....	amorphous ...
21	....	insoluble	insoluble	soluble conc. H_2SO_4....	tetrag. hexag.
22	....	soluble	....	....	[or rhombic
23	....	insoluble	insoluble	insoluble HNO_3.......	....
24	....	insoluble	....	sol. HCl; insol. HNO_3..	....
25	....	insoluble	....	insol. dil. a.; sol. alk., hot conc. H_2SO_4	crystals......
26	....	v. soluble	....	sol. dil. H_2SO_4, HCl....	rhomb. leaflets
27	....	0.00002	insoluble	sol. conc. HCl, alk. sul-	yellow hexag.
28	617°–634°	soluble	decomposes	...............[phides	yellow crystals
29	603°–628°	$83.9^{0°}$	$269.8^{15°}$	sol. alk., al., tartaric acid	....
30	decomp.	$118.7^{0°}$	∞	sol. alk., al., tartaric acid	monoclinic....
31	....	insoluble	....	sol. HCl.............	....
32	....	insoluble	....	sol. hot conc. HCl.....	....
33	....	v. soluble	....	....	prisms.......
34	....	insoluble	decomp.	sol. dil. a., alk.; insol. NH_4OH	yellow. amor.
35	....	$0.98^{20°}$	$4.03^{100°}$	sol. dil. HCl, KOH.....	red crystals...
36	....	insoluble	....	sol. a., NH_4Cl; insol. alk.	black regular..
37	....	insoluble	insoluble	sol. dil. acids, al........	....
38	....	insoluble	....	sol. alk. sulphides......	steel gray pr.

† Orange red octahedra. ‡ Decomposes at red heat.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Stannous sulphate	$SnSO_4$	215.07	....	....
2	sulphide	SnS	151.07	$5.27^{15°}$	880°
3	telluride	$SnTe$	246.50	$6.478^{0°}$	....
4	Strontium	Sr	87.63	2.54	900°
5	arsenate	$SrHAsO_4.H_2O$	245.01	$3.606^{15°}$	H_2O, 125°
6	arsenite	$Sr(AsO)_2.4H_2O$	373.61	....	....
7	borate	$SrB_4O_7.4H_2O$	315.69	....	....
8	boride	SrB_6	153.63	$3.28^{15°}$	....
9	bromate	$Sr(BrO_3)_2.H_2O$	361.49	3.773	dec. 240°
10	bromide	$SrBr_2$	247.46	4.216^{24}_{4}	498°–630°
11	"	$SrBr_2.6H_2O$	355.56	2.358	....
12	carbide	SrC_2	111.63	3.19	....
13	carbonate	$SrCO_3$	147.63	3.62	dec. 1155°
14	chlorate	$Sr(ClO_3)_2$	254.55	3.152	dec. 290°.
15	"	$Sr(ClO_3)_2.8H_2O$	398.678	....	....
16	chloride	$SrCl_2$	158.55	3.054	872°
17	"	$SrCl_2.6H_2O$	266.646	$1.964^{16.7°}$	112°†
18	chromate	$SrCrO_4$	202.73	$3.895^{15°}$	....
19	cyanide	$Sr(CN)_2.4H_2O$	211.71	....	decomp.
20	dithionate	$SrS_2O_6.4H_2O$	319.83	2.373	$4H_2O$, 78°
21	ferrocyanide	$Sr_2Fe(CN)_6.15H_2O$	657.40	....	....
22	fluoride	SrF_2	125.63	4.21	902°
23	fluosilicate	$SrSiF_6.2H_2O$	265.96	2.999	§
24	formate	$Sr(CHO_2).2H_2O$	213.68	2.25	decomp.
25	hydrosulphide	$Sr(SH)_2$	153.79	....	decomp.
26	hydroxide	$Sr(OH)_2$	121.65	3.625	375°
27	"	$Sr(OH)_2.8H_2O$	265.77	$1.396^{16°}$	....
28	iodide	SrI_2	341.47	4.549^{25}_{4}	507°–645°
29	"	$SrI_2.6H_2O$	449.57	4.415	....
30	molybdate	$SrMoO_4$	247.63	4.145	....
31	nitrate	$Sr(NO_3)_2$	211.65	$2.98^{16.8°}$	645°
32	"	$Sr(NO_3)_2.4H_2O$	283.71	$2.249^{15.5°}$	....
33	nitrite	$Sr(NO_2)_2.H_2O$	197.67	$2.645^{27°}$	H_2O, 44°
34	oxalate	$SrC_2O_4.H_2O$	193.65	....	decomp.
35	oxide	SrO	103.63	4.45–4.75	3000°
36	" per-	SrO_2	119.63	0.546	decomp.
37	" "	$SrO_2.8H_2O$	263.76	....	$8H_2O$,100°
38	permanganate	$Sr(MnO_4)_2.3H_2O$	379.55	....	decomp.
39	phosphate acid	$SrHPO_4$	183.68	$3.544^{15°}$	....
40	salicylate	$Sr(C_7H_5O_3)_2.2H_2O$	397.742	....	....

* Loses H_2O at 120° † Loses $4H_2O$ at 60°, $6H_2O$ at 100°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1		18.9^{19°	18.2^{100°	sol. H_2SO_4	crystals
2	1090°	0.000002	insoluble	sol. conc. HCl, $(NH_4)_2Sx$	gray crystals
3				insol. conc. HCl	gray crystals
4	burns	decomp.	decomp.	sol. acids, alcohol	crystalline
5	$1\frac{1}{2}H_2O$, 225°	$0.284^{15.5^\circ}$	decomp.	sol. in acids ... [H_3AsO_4	rhomb. needles
6		s. soluble		s. soluble al., $Sr(OH)_2$,	crystalline
7			77^{100°	sol. HNO_3, NH_4 salts	
8		insoluble	insoluble	soluble HNO_3	black crystals.
9	*	$33^{15^\circ-18^\circ}$			monocl. prisms
10		87.7^{0°	250^{110°	sol. ethyl and amyl. al.	needles
11		204.2^{0°	∞		
12		decomp.	decomp.	decomp. by acids	black crystals.
13		0.0011^{18°		0.12 H_2CO_3aq.; sol. a., NH_4 salts	rhombic
14		174.9^{18°	v. soluble	soluble alcohol	rhomb. or mon.
15		soluble	v. soluble	soluble alcohol	needles
16		44.2^{0°	101.9^{100°	sol. absolute alcohol	
17		106.2^{0°	205.8^{40°		hexag. needles
18		0.12^{15°		sol. acetic acid, NH_4 salts	monocl. prisms
19		v. soluble			crystalline
20		22^{16°	67^{100°	insoluble alcohol	hexag. plates
21		50	100		yellow monocl.
22	‡	0.012^{18°	s. soluble	insol. HF; sol. HCl	reg. octahedra
23	heat	3.2^{15°		0.06^{15°, 50% al.; sol. HCl	tetrag. prisms.
24		soluble	soluble		rhombic
25		soluble	decomp.		crystals
26		0.41^{0°	21.83^{100°	soluble NH_4Cl	
27		0.90^{0°	47.71^{100°	soluble NH_4Cl	tetragonal
28	decomp.	164^{0°	370^{100°		plates
29		448.9^{0°	∞		crystals
30		0.0104^{17°			
31		39.5^{0°	101.1^{100°	0.012 absolute al.	reg. octahedra
32		60.43^{0°	206.5^{100°	insol. HNO_3	triclinic
33		$62.83^{19.5^\circ}$			hexagonal
34		0.0051^{18°	5^{100°	sol. HCl	
35		decomp. to $Sr(OH)_2$		s. sol. al.; insol. ether	gray white rhombic
36		0.008^{20°	decomp.	v. sol. a., NH_4Cl	
37		0.018^{20°	decomp.	insol. NH_4OH	crystalline
38		270^{0°	291^{18°		purple regular.
39		insoluble		sol. a., NH_4 salts	rhombic plates
40		5.6^{25°	28.6^{100°	1.5^{25°, 9.5^{78° al.	crystalline

‡ Decomposes at 1000°. § $2H_2O$ gentle heat.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Strontium** selenate	$SrSeO_4$	230.83	4.23	....
2	silicate	$SrSiO_3$	163.93	3.91	1529
3	sulphate	$SrSO_4$	183.70	3.71–3.97	*
4	" acid	$Sr(HSO_4)_2$	281.79	....	decomp.
5	sulphide mono-	SrS	119.70	$3.72^{15°}$	....
6	" tetra-	$SrS_4.6H_2O$	324.01	....	....
7	sulphite	$SrSO_3$	167.70	....	decomp.
8	sulphocyanate	$Sr(CNS)_2.3H_2O$	257.84	....	$3H_2O$,100°
9	tartrate	$SrC_4H_4O_6.4H_2O$	307.73	$1.966\frac{19.8}{4}$	....
10	thiosulphate	$SrS_2O_3.5H_2O$	289.85	$2.178^{17°}$	$4H_2O$,100°
11	**Sulphur** amorph. soft	S_8	256.56	$1.9556^{0°}$	>120°
12	" yellow	S_8	256.56	2.046	‡
13	colloidal Sδ	S_8	256.56	....	....
14	plastic Sγ	S_8	256.56	1.92	....
15	monoclinic Sβ	S_8	256.56	1.958	119.25°
16	rhombic Sα	S_8	256.56	$2.05–2.07^{0°}$	114.5°
17	chloride mono-	S_2Cl_2	135.06	$1.7094\frac{0}{4}$	−80°
18	" di-	SCl_2	103.99	$1.622\frac{15°}{15}$	−78°
19	" tetra-	SCl_4	173.91	....	−30°
20	bromide	S_2Br_2	223.98	$2.6355^{20°}$	−46°
21	chloriodide	SCl_7I	407.21	....	decomp.
22	hexafluoride	SF_6	146.07	5.03	−55°
23	monoxytetrachloride	S_2OCl_4	221.98	$386^{100°}$ D. $1.656^{0°}$	decomp.
24	oxide di-	SO_2	64.07	2.2639 D. $1.43368^{0°}$	−76.1°
25	" sesqui-	S_2O_3	112.14	....	decomp.
26	" α-tri-	SO_3	80.07	2.75 D. $1.97^{20°}$	14.8°
27	" β-tri-	$(SO_3)_2$	160.14	1.040	50°
28	" hepta-	S_2O_7	176.14	....	0°
29	pentoxydichloride	$S_2O_5Cl_2$	215.06	$1.819^{18°}$	−39°
30	trioxytetrachloride	$S_2O_3Cl_4$	253.98	....	57°
31	**Sulphuric Acid**	H_2SO_4	98.09	$1.8342\frac{18}{4}$	10.46°
32	" "	$H_2SO_4.H_2O$	116.10	$1.788^{17°}$	8.53°
33	" "	$H_2SO_4.2H_2O$	134.12	$1.665^{0°}$	−38.9°
34	" " pyro-	$H_2S_2O_7$	178.16	1.89	35°
35	" oxychloride	SO_2Cl_2	134.99	$1.66738\frac{20}{4}$	....
36	" oxyfluoride	SO_2F_2	102.07	....	−120°
37	**Sulphurous** oxybromide	$SOBr_2$	223.91	$2.61^{0°}$	....

* Decomposes at wh. ht. † Decomposes at 160°–170°. ‡ Ignition point 255°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	....	insol. HNO_3; sol. hot HCl	rhombic......
2	....	insoluble	....	....	prisms.......
3	....	$0.0114^{18°}$	$0.0104^{100°}$	insol. dil. H_2SO_4, al.; s. sol. acids	rhombic......
4	....	decomposes	....	$14^{70°}$ conc. H_2SO_4......	....
5	....	sol. and dec.	....	soluble alcohol........	cubical.......
6	....	soluble	....	soluble alcohol........	reddish cryst.
7	....	0.0033	....	v. soluble H_2SO_3.......	crystals......
8	†	v. soluble	....	v. soluble alcohol......	....
9	....	$0.112^{0°}$	$0.755^{85°}$...	....	monocl. prisms
10	....	$25^{13°}$	$57^{100°}$	insoluble alcohol......	monoclinic....
11	444.6°	insoluble	insoluble	partly sol. CS_2........	pale yel. amor-[phous
12	444.6°	insoluble	....	insoluble CS_2..........	
13	444.6°	soluble	....	insol. NaCl...........	pale yellow...
14	444.6°	insoluble	....	insol. CS_2............	citron yel. am.
15	444.6°	insoluble	insoluble	sol. CS_2, al., CH_3Cl, C_6H_6	yellow prisms.
16	444.6°	insoluble	insoluble	$24^{0°}$, $181.3^{55°}CS_2$......	yellow octahed.
17	138°	decomposes	decomposes	sol. CS_2, C_6H_6, al., ether.	yel. red liquid
18	59°	....	....	....	dark red.....
19	§	decomposes	decomposes	....	yel. brown liq.
20	54° ‖	decomposes	decomposes	....	red..........
21	....	decomposes	....	....	red yel. prisms
22	−62°	s. soluble	....	s. sol. al.; sol. KOH....	crystals......
23	....	decomposes	decomposes	....	deep red liquid
24	−10°	7979 c.c.$^{0°}$	1560 c.c.$^{50°}$	sol. al., H_2SO_4, $H.C_2H_3O_2$	....
25	....	decomposes	....	decomp. by al., ether..	bluegreen crys.
26	46.2°	decomposes	decomposes	sol. conc. H_2SO_4.......	prismatic crys.
27	....	decomposes	decomposes	....	silky needles..
28	decomp.	decomposes	decomposes	sol. conc. H_2SO_4.......	needles.......
29	150°	decomposes	decomposes	....	liquid........
30	sublimes	decomposes	decomposes	....	crystalline....
31	**	∞	∞	decomposes alcohol....	....
32	210°–338°	∞	∞	decomposes alcohol....	prisms.......
33	170°–190°	∞	∞	decomposes alcohol....	....
34	decomposes	decomposes	decomposes	decomposes...........	crystals......
35	69.15°	decomposes	....	sol. glacial acetic acid...	liquid........
36	−52°	$10^{90°}$	....	soluble alkalies........	....
37	68° ¶	decomposes	....	....	orange yellow.

§ Decomposes at 20°. ‖ At 0.18 mm. ** Decomposes at 40°. ¶ At 40 mm.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Sulphurous				
1	oxychloride	$SOCl_2$	118.99	1.6767^{0}_{4}	....
2	oxyfluoride	SOF_2	86.07	3.0076	−110°
3	**Tantalum**	Ta	181.5	14.491^{16}_{16}	2900°
4	bromide	$TaBr_5$	585.10	....	240°
5	chloride	$TaCl_5$	358.80	$3.68^{27°}$	211.3°
6	fluoride	TaF_5	276.50	$4.981^{15°}$	94°
7	nitride	Ta_3N_5	614.55	....	burns
8	oxide di-	TaO_2	213.50	....	oxidizes
9	" tetr-	Ta_2O_4	427.	....	oxidizes
10	" pent-	Ta_2O_5	443.00	7.6	infusible
11	sulphide	Ta_2S_4	493.30	....	oxidizes
12	**Tartaric Acid**	$H_2.C_4H_4O_6$	150.05	1.7549	decomp.
13	**Telluretted Hydrogen**	H_2Te	129.52	4.39 D.	−48°
14	**Telluric Acid**	H_2TeO_4	193.52	$3.425^{18.8°}$	dec. 160°
15	" " *α*	$H_2TeO_4.2H_2O$	229.55	3.053	$2H_2O$,130°
16	" " *β*	$H_2TeO_4.2H_2O$	229.55	3.071	$2H_2O$,130°
17	**Tellurium**	Te	127.5	$6.015^{20°}$	446°
18	"	Te	127.5	6.27	452°
19	bromide di-	$TeBr_2$	287.34	....	280°
20	bromide tetra-	$TeBr_4$	447.18	4.31^{15}_{4}	380°
21	chloride di-	$TeCl_2$	198.42	6.89 D.	175°
22	" tetra-	$TeCl_4$	269.34	9.2 D.	214°
23	iodide di-	TeI_2	381.34	....	....
24	" tetra-	TeI_4	635.18	....	....
25	nitrate	$4TeO_2.N_2O_5.1\frac{1}{2}H_2O$	773.04	....	....
26	oxide mon-	TeO	143.50	....	oxidizes
27	" di-	TeO_2	159.50	$5.89^{0°}$	dull redness
28	" tri-	TeO_3	175.50	$5.0704^{14.5°}$	decomp.
29	" thio-	$TeSO_3$	207.57	....	30°
30	sulphite	$(TeO_2)_2SO_3$	399.07	....	....
31	**Tellurous Acid** *α*	H_2TeO_3	177.52	3.035	dec. 40°
32	" " *β*	H_2TeO_3	177.52	3.071	....
33	**Terbium**	Tb	159.2	....	....
34	chloride	$TbCl_3$	265.58	$4.35^{0°}_{4}$	588°
35	oxide	Tb_2O_3	366.40	....	....
36	**Thallium**	Tl	204.0	11.85	302°
37	acetate	$TlC_2H_3O_2$	263.02	....	....
38	bromide mono-	TlBr	283.92	$7.540^{21.7°}$	450°

* Decomposes at 180°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	78°	decomposes	....	....	liquid........
2	−30°	decomposes	decomposes	soluble ether, benzine..	....
3	....	insoluble	insoluble	insol. HCl, HNO_3, H_2SO_4 sol. HF, fused alk.	blk. crystalline
4	320°	decomposes	....	sol. abs. al., ether.....	yellow crystals
5	242°	decomposes	....	sol. H_2SO_4, abs. alcohol.	pale yel. prisms
6	226°	....	....	sol. HF.............	tetragonal....
7	....	insoluble	....	insol.a.; sol. HNO_3+ HF	yellow amorph.
8	....	insoluble	....	insoluble acids........	brown powder.
9	....	insoluble	....	insoluble acids........	dark gray.....
10	....	insoluble	....	insol. a.; sol. HF......	rhomb. prisms
11	....	....	....	....	....
12	....	$115^{0°}$	$343^{100°}$	$25.6^{15°}$ al.; sol. ether...	monocl. prisms
13	0°	soluble	....	soluble alk...........	gas..........
14	....	insoluble	s. soluble	insoluble cold a., alk...	....
15	....	$19.7^{0°}$	$258.5^{100°}$	sol. a., alk.; insol. al....	regular octah..
16	....	$19.7^{0°}$	$258.5^{100°}$	sol. a., alk.; insol. al....	monocl. prisms
17	1390°	insoluble	insoluble	sol. conc. H_2SO_4, KCN, HNO_3, aq. r., KOH; insol. CS_2	amorphous....
18	1390°	insoluble	insoluble		rhombohedra .
19	339°	decomposes	....	....	steel gray needles
20	420°	v. soluble	....	....	orange.......
21	327°	decomposes	....	decomposed by HCl....	black crystals.
22	414°	decomposes	soluble	sol. dil. HCl..........	yel. crystalline
23	....	insoluble	insoluble	....	black crystals.
24	....	s. soluble	decomp.	soluble HI...........	gray crystals..
25	....	decomposes	....	soluble HNO_3.........	orthorhombic
26	....	insoluble	insoluble	sol. HCl, H_2SO_4........	black amorph.
27	>700°	0.00067	....	sol. acids, alk.........	yel. octahedral orthorhomb.
28	....	insoluble	insoluble	insol. a.; sol. hot KOH..	orange crystal.
29	*	decomp.	....	soluble H_2SO_4	red amorphous
30	....	....	....	....	....
31	....	s. soluble	decomp.	soluble acids, alk......	octahedral ...
32	....	....	....	....	monocl. prisms
33	....	....	....	....	....
34	....	....	....	....	needles.......
35	....	....	....	soluble acids..........	orange amorph.
36	1280°	insoluble	insoluble	sol. HNO_3, H_2SO_4......	bluish white ..
37	....	v. soluble	....	v. soluble alcohol......	silky needles..
38	....	$0.0466^{20°}$	$0.869^{68.5°}$	....	regular ....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Thallium				
1	bromide tri-	$TlBr_3$	443.76	....	decomp.
2	" di-	$TlBr_2$	363.84	....	....
3	carbonate	Tl_2CO_3	468.00	7.06–7.16	272°
4	chlorate	$TlClO_3$	287.46	$5.047^{9°}$	....
5	chloride mono-	$TlCl$	239.46	7.02	426°
6	" sesqui-	Tl_2Cl_3	514.38	5.9	400°–500°
7	" tri-	$TlCl_3$	310.38	....	25°
8	" "	$TlCl_3.4H_2O$	328.40	....	36°–37°
9	chloroplatinate	Tl_2PtCl_6	815.96	$5.76^{17°}$	....
10	chromate	Tl_2CrO_4	524.0	....	....
11	cyanide	$TlCN$	230.01	....	decomp.
12	dichromate	$Tl_2Cr_2O_7$	624.00	....	....
13	ferrocyanide	$Tl_4Fe(CN)_6.2H_2O$	1064.09	4.641	....
14	fluoride mono-	TlF	223.00	....	....
15	" tri-	TlF_3	261.0	....	....
16	fluosilicate	$Tl_2SiF_6.2H_2O$	586.33	....	....
17	hydroxide (-ous)	$TlOH$	221.01	....	dec. 100°
18	" (-ic)	$TlO.OH$	237.01	....	H_2O, 115°
19	" (-ic)	$Tl(OH)_3$	255.02	....	....
20	iodide mono-	TlI	330.92	$7.072^{15.5°}$	431°
21	" sesqui-	Tl_2I_3	788.76	....	....
22	" tri-	TlI_3	584.76	....	....
23	nitrate (-ous)	$TlNO_3$	266.01	5.55	205°
24	" (-ic)	$Tl(NO_3)_3$	390.06	....	....
25	oxide (-ous)	Tl_2O	424.00	....	>870°
26	" (-ic)	Tl_2O_3	456.00	$5.56^{0°}$	760°
27	perchlorate	$TlClO_4$	303.46	4.89	501°
28	phosphate	Tl_3PO_4	707.04	$6.89^{10°}$	....
29	selenate	Tl_2SeO_4	551.2	$7.019^{18°}$	>400°
30	sulphate (-ous)	Tl_2SO_4	504.07	6.77	632°
31	" acid	$TlHSO_4$	301.08	....	115°–120°
32	" (-ic)	$Tl_2(SO_4)_3.7H_2O$	822.32	....	$6H_2O$,200°
33	selenide	Tl_2Se	487.20	....	340°
34	sulphide (-ous)	Tl_2S	440.07	8.0	fusible
35	" (-ic)	Tl_2S_3	504.21	....	12°
36	sulphite (-ous)	Tl_2SO_3	488.07	$6.427^{20°}$	....
37	sulphocyanate	$TlCNS$	262.08	....	....
38	**Thorium**	Th	232.40	11.00^{17}_{17}	>1700°
39	"	Th	232.40	11.23	....
40	boride	ThB_4	276.40	$7.5^{15°}$	....

* This form is stable below 72.8°. Between 72.8° and 142.5° rhombo-

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1		soluble	v. soluble	v. soluble alcohol	yellow needles
2		decomp.	decomp.		yellow needles
3		$4.02^{15.5^\circ}$	27.21^{100°	insol. al., ether	monoclinic
4		2.8^{0°	57.3^{100°		
5	708°–719°	0.2^{0°	1.6^{100°	s. sol. HCl; insol. al., NH_3	regular
6	decomp.	0.26^{15°	1.9^{100°		yel. hexagonal
7	decomp.	v. soluble			hexag. plates
8		86.2^{17°	decomp.		needles
9		0.0064^{15°	0.05^{100°	[acids, alk.	pale orange
10		0.03^{60°	0.2^{100°	insol. $H.C_2H_3O_2$; s. sol.	yellow
11		$16.8^{28.5^\circ}$			tablets
12		insoluble		decomp. by acids	red crystalline
13		0.37^{18°	3.93^{101°		yellow triclinic
14		80^{15°	v. soluble	s. sol. alcohol	reg. octahedra
15		insoluble		insol. cold HCl	olive green
16		v. soluble			reg. octahedra
17		v. soluble		soluble alcohol . . . [alk.	pale yel. prisms
18		insoluble		sol. a., NH_4 salts; insol.	yellow crystals
19		insoluble		v. sol. dil. acids	brown hexag.
20	800°–806°	0.0064^{20°	0.125^{100°	insol. al., KI; sol. aq. r.	yellow regular
21		insoluble		s. sol. alcohol	black needles
22				soluble ether	brown needles
23		10.6^{15°	588^{107°	insoluble alcohol	rhomb. prisms*
24		soluble			crystals
25	O, 1865°	v. soluble		soluble alcohol	yellow
26	O_2, 875°	insoluble	insoluble	soluble acids; insol. alk.	d. violet hexag.
27	decomp.	10^{15°	166.6^{100°		
28		0.5^{15°	0.67^{100}	insol. al.; sol. NH_4 salts.	needles
29		2.8^{20°	8.5^{80°	insoluble al., ether	prism. needles.
30	decomp.	5.4^{25°	18.5^{100}		rhomb. prisms.
31					
32	decomp.	decomposes		soluble dil. H_2SO_4	leaflets
33		insoluble		insoluble warm acids	gray crystals
34	decomp.	0.0379^{20°	s. soluble	sol. a.; insol. alk.	blue black tetr.
35	decomp.	insoluble	insoluble	soluble H_2SO_4	black amorph.
36		3.34^{15°	v. soluble	insoluble alcohol	crystals
37		0.315^{20°	0.732^{40°	insoluble alcohol	needles
38		insoluble	insoluble	sol. HCl., H_2SO_4; s. sol.	gray amorph.
39		insoluble	insoluble	HNO_3, insol. alk.	crystalline
40		insoluble	insoluble	sol. HNO_3, conc. HCl	prisms

hedral crystals are formed, and above 142.5° regular crystals.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Thorium** boride	ThB_6	298.40	$6.4^{15°}$	....
2	bromide	$ThBr_4$	552.08	5.62	....
3	carbide	ThC_2	256.40	$8.96^{18°}$	burns
4	carbonate	$Th(CO_3)_2$	352.40	....	....
5	chloride	$ThCl_4$	374.24	4.59	820°
6	fluoride	$ThF_4.4H_2O$	380.46	....	H_2O,100°†
7	hydroxide	$Th(OH)_4$	300.43	....	....
8	iodide	ThI_4	740.16	....	....
9	nitrate	$Th(NO_3)_4.12H_2O$	696.67	....	....
10	oxalate	$Th(C_2O_4)_2$	418.40	$4.637^{16°}$	decomp.
11	oxide di-	ThO_2	264.40	$9.876^{15°}$	infusible
12	" per-	Th_2O_7	576.80	....	....
13	platinocyanide	$Th(Pt(CN)_4)_2.16H_2O$	1119.18	2.460	....
14	sulphate	$Th(SO_4)_2$	424.54	$4.2252^{17°}$	....
15	"	$Th(SO_4)_2.9H_2O$	586.68	$2.766^{16°}$	$9H_2O$,400°
16	sulphide	ThS_2	296.54	6.8	....
17	**Thulium**	Tm	168.5	....	....
18	**Tin** ‡	Sn	119.0	6.53–6.56	sta. > 170°
19	"	Sn	119.0	$7.2984^{15°}$	232°
20	"	Sn	119.0	$5.8466^{15°}$	sta. < 20°
21	**Titanic Acid**	H_2TiO_3	98.12	....	....
22	**Titanium**	Ti	48.1	$4.50^{17.5°}$	2200°
23	bromide tetra-	$TiBr_4$	367.78	2.6	39°
24	carbonitride	$Ti_5(CN)_4$	344.54	5.28	....
25	chloride di-	$TiCl_2$	119.02	....	....
26	" tri-	Ti_2Cl_6	308.96	....	dec. 440°
27	" tetra-	$TiCl_4$	189.94	1.7604^{0}_{4}	−25°
28	fluoride tri-	Ti_2F_6	210.20	....	....
29	" tetra-	TiF_4	124.10	$2.798^{20.5°}$	284°–287°
30	iodide tetra-	TiI_4	555.78	....	150°
31	nitrate	$5TiO_2.N_2O_5.6H_2O$	616.62	....	....
32	oxalate	$Ti_2(C_2O_4)_3.10H_2O$	540.36	....	....
33	oxide sesqui-	Ti_2O_3	144.20	....	oxidizes
34	" di-	TiO_2	80.10	3.75–4.25	1560°
35	" per-	TiO_3	96.10	....	....
36	sulphate	$Ti_2(SO_4)_3$	384.41	....	....
37	**Tungsten**	W	184.0	18.77	2800°
38	bromide di-	WBr_2	343.84	....	dec. 400°
39	" penta-	WBr_5	583.60	....	276°

* In vacuo. † Loses $2H_2O$ at 140°–200°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	insoluble	insoluble	sol. HNO_3 conc. HCl ..	violet amorph.
2	725° *	soluble	....	....	crystals ......
3	....	decomposes	....	.............[Na_2CO_3	....
4	....	insoluble	decomp.	insol. CO_2aq.; sol. conc.	....
5	....	v. soluble	....	sol. KCl, al., ether.....	needles.......
6	....	insoluble	....	insoluble HF.........	crystalline....
7	....	insoluble	....	soluble a.; insol. alk....	gelatinous....
8	....	soluble	....	....	....
9	....	v. soluble	....	v. soluble alcohol......	plates........
10	....	insoluble	....	sol. hot $(NH_4)_2C_2O_4$ aq..	....
11	....	insoluble	....	sol. hot H_2SO_4........	regular.......
12	....	insoluble	....	....	....
13	....	s. soluble	soluble	....	yel. green or-
14	....	$0.74^{0°}$	$6.76^{55°}$	....	..[thorhombic
15	....	$0.97^{0°}$	$9.41^{55°}$	....	monoclinic....
16	....	insoluble	insoluble	s. sol. a.; sol. hot aq. r .	....
17	....	insoluble	insoluble	....	....
18	2275°	insoluble	insoluble	sol. HCl, H_2SO_4, dil.	rhombic .....
19	....	insoluble	insoluble	HNO_3, aq. r., hot	white tetrag.
20	....	....	....	KOH	gray.........
21	....	insoluble	insoluble	insol. al.; sol. a., alk. ..	....
22	....	insoluble	decomp.	soluble acids..........	d. gray amorp.
23	230°	decomposes	....	....	orange cryst. .
24	white heat	insoluble	insoluble	insol. a.,sol.HNO_3+ HF	reddish octah.
25	....	decomposes	....	insol. CS_2, ether, $CHCl_3$.	black........
26	....	soluble	....	v. sol. al.; insol. ether; sol. HCl	dark violet ...
27	136.4°	decomposes	....	sol. dil. HCl.........	....
28	....	soluble	....	..............[H_2SO_4	purple red....
29	>400°	decomposes	....	insol. ether; sol. conc.	....
30	360°	v. soluble	....	....	reddish octah..
31	....	soluble	....	....	plates........
32	....	soluble	soluble	insoluble alcohol, ether.	yellow prisms.
33	....	....	....	soluble H_2SO_4, HF.....	black amorph.
34	....	insoluble	....	sol. conc. H_2SO_4, alk...	white to black tetrag or rhom.
35	....	....	....	soluble acids..........	yellow.......
36	....	insoluble	insoluble	sol.dil. a.; insol. al. ether	green crystais.
37	....	insoluble	insoluble	sol.HNO_3,aq.r.,conc. hot	gray to black..
38	....	decomposes	....	..............[KOH	bluish black...
39	333°	decomposes	....	sol.caustic alkalies.....	vio.-br. need.

‡ For salts of Tin see "Stannic" and "Stannous."

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Tungsten** carbide	W_2C	380.0	$16.06^{18°}$	....
2	chloride di-	WCl_2	254.92	....	....
3	" tetra-	WCl_4	325.84	....	decomp.
4	" penta-	WCl_5	361.30	....	248°
5	" hexa-	WCl_6	396.76	$13.3^{350°}$ D.	275°
6	dioxydibromide	WO_2Br_2	375.84	....	red heat
7	dioxydichloride	WO_2Cl_2	286.92	....	266°
8	iodide	WI_2	437.84	$6.9^{18°}$	....
9	oxide di- (brown)	WO_2	216.00	12.11	....
10	" tri-	WO_3	232.00	7.16	red heat
11	oxytetrabromide	$WOBr_4$	519.68	....	277°
12	oxytetrachloride	$WOCl_4$	341.84	....	208°–210°
13	phosphide	W_2P	399.04	5.207	....
14	"	WP	215.04	8.5	....
15	"	WP_2	246.08	5.8	decomp.
16	sulphide di-	WS_2	248.12	$7.5^{10°}$	....
17	" tri-	WS_3	280.21	....	....
18	**Tungstic Acid**	H_2WO_4	250.02	....	$\frac{1}{2}H_2O$,100°
19	" " meta	$H_2W_4O_{13}$	946.02	....	....
20	**Uranic Acid**	H_2UO_4	304.52	$5.93^{15°}$	H_2O,250°–300°
21	**Uranium**	U	238.5	18.685^{13}_{4}	800°
22	bromide tri-	UBr_3	478.26	....	....
23	" tetra-	UBr_4	558.18	4.838^{21}_{4}	....
24	carbide	U_2C_3	513.0	$11.28^{18°}$	....
25	chloride tri-	UCl_3	344.88	....	....
26	" tetra-	UCl_4	380.34	....	....
27	" penta-	UCl_5	415.80	....	dec. 120°
28	fluoride tetra-	UF_4	314.50	....	1000°
29	hexa-	UF_6	352.5	$4.68^{20.7°}$	69.5 (2 atm.)
30	iodide tetra-	UI_4	746.18	$5.6^{15°}$	500°
31	oxide di-	UO_2	270.50	10.95	2176°
32	" (-oso, -ic)	U_3O_8	843.50	7.31	decomp.
33	" tri-	UO_3	286.50	5.02–5.26	decomp.
34	" per-	$UO_4.2H_2O$	338.53	....	....
35	sulphate (-ous)	$U(SO_4)_2.4H_2O$	502.70	....	$4H_2O$,300°
36	sulphide di-	US_2	302.64	....	>1100°
37	" sesqui-	U_2S_3	573.21	....	burns
38	**Uranyl** acetate	$UO_2(C_2H_3O_2)_2.2H_2O$	424.58	....	$2H_2O$,275°

* Burns at 150°–170°. † Very volatile.

Number.	Boiling Point, °C.	Solubility in 100 Parts.			Crystalline Form and Color.
		Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	
1	...	insoluble	...	s. sol. HCl, H_2SO_4; sol.	...
2	...	decomposes	...	... [HNO_3	gray amorph..
3	...	decomposes	...	...	gray crystals..
4	275.6°	decomposes	...	s. soluble CS_2 ...	black needles .
5	346.7°	...	dec. 60°	v. soluble CS_2, $POCl_3$...	steel-blue reg..
6	decomposes	...	...	...	red prisms....
7	...	soluble	decomp.	sol. alk. and NH_4OH...	yellow tablets.
8	...	...	...	...	greenish......
9	...	insoluble	...	soluble conc. KOH, a..	brown rhombic
10	...	insoluble	...	insol. a.; sol. alk......	yellow rhombic
11	327°	decomposes	...	...	black needles .
12	227.5°	...	...	soluble CS_2..........	red needles...
13	...	...	...	insol. a.; sol. fused $Na_2CO_3 + NaNO_3$	dark gray pris.
14	...	insoluble	...	insol. alk., HCl; sol. HNO_3 + HF	gray prisms...
15	...	insoluble	insoluble	insol. al., ether; sol. HNO_3 + HF	black crystals.
16	...	...	...	oxidized by HNO_3	dark gray crys.
17	...	s. soluble	soluble	sol. alk. sulphides, alk..	black powder .
18	...	insoluble	s. soluble	sol. alkalies..........	yellow........
19	...	soluble	...	...	yellow octahed.
20	...	insoluble	...	sol. a., alk. carbonates; insol. alk.	yellow powder.
21	*	insoluble	insoluble	sol. a. insol. alk......	white crystals.
22	†	soluble	...	...	d. brown need.
23	‡	soluble	...	...	black leaflets .
24	...	decomp.	decomp.	soluble acids.........	crystalline....
25	...	v. soluble	...	...	brownish red .
26	red heat	v. soluble	decomp.	soluble NH_4Cl.........	dark green reg.
27	...	sol. and dec.	...	...	dark needles..
28	...	insoluble	...	insol. dil. a. sol. conc. a.	green powder .
29	55°	soluble	...	sol. CCl_4, $CHCl_3$; insol. CS_2	yel. monocl.
30	...	soluble	...	...	black needles.
31	...	insoluble	insoluble	sol. HNO_3, conc. H_2SO_4	black octahed.
32	...	...	...	sol. HNO_3, conc. H_2SO_4	olive gr. pow..
33	...	...	...	...	yellow powder
34	...	hygroscopic	...	decomp. by HCl......	yellow crystals
35	...	decomposes	...	soluble dil. acids......	green monocl.
36	oxidizes	decomposes	...	sol. conc. HCl.........	gray'h bl.quad.
37	...	...	...	s.sol.HCl;sol.conc.HNO_3	gray black....
38	...	soluble	decomp.	soluble alcohol........	yellow monocl.

‡ Volatile at red heat.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
	Uranyl [ate				
1	ammonium carbon-	$UO_2CO_3.2(NH_4)_2CO_3$	522.65		decomp.
2	chloride	UO_2Cl_2	341.42		fusible
3	nitrate	$UO_2(NO_3)_2.6H_2O$	502.62	2.807	60.2°
4	phosphate [ate	$UO_2(HPO_4)_2.4H_2O$	534.66		
5	potassium carbon-	$UO_2CO_3.2K_2CO_3$	606.90		CO_2, 300°
6	sodium carbonate	$UO_2CO_3.2Na_2CO_3$	542.50		
7	sulphate	$UO_2SO_4.3H_2O$	420.62	$3.280^{16.5°}$	
8	sulphide	UO_2S	302.57		dec. 40–50
9	**Vanadic Acid** meta-	HVO_3	100.01		
10	" " pyro-	$H_4V_2O_7$	218.03		
11	**Vanadium**	V	51.0	6.025^{15}_{15}	1680°
12	bromide tri-	VBr_3	290.66		oxidizes
13	carbide	VC	63.0	5.36	
14	chloride di-	VCl_2	121.92	$3.23^{18°}$	
15	" tri-	VCl_3	157.38	$3.00^{18°}$	oxidizes
16	" tetra-	VCl_4	192.84	1.8653^{0}_{4}	$< -18°$
17	fluoride tri-	VF_3	108.0	$3.3628^{19°}$	$> 800°$
18	" "	$VF_3.3H_2O$	162.05		$3.H_2O$,130
19	" tetra-	VF_4	127.0	$2.9749^{23°}$	dec. 325°
20	" penta-	VF_5	146.0	$2.1766^{19°}$	
21	oxide di-	V_2O_2	134.00	3.64	burns
22	" tri-	V_2O_3	150.00	$4.87^{18°}_{4}$	infusible
23	" tetr-	V_2O_4	166.00		infusible
24	" pent-	V_2O_5	182.00	$3.357^{18°}_{4}$	658°
25	oxydibromide	$VOBr_2$	226.84		dec. 180°
26	oxytribromide	$VOBr_3$	306.76	$2.9325^{14.5°}$	130°–136°
27	oxymonochloride	VOCl	102.46		
28	didioxymonochlo-	V_2O_2Cl	169.46		
29	oxydichloride [ride	$VOCl_2$	137.92	$2.88^{13°}$	
30	oxytrichloride	$VOCl_3$	173.38	$1.836^{17.5°}$	$< -15°$
31	silicide	VSi_2	107.6	4.42	†
32	"	V_2Si	130.3		†
33	sulphide di-	V_2S_2	166.14	4.2–4.4	oxidizes
34	" tri-	V_2S_3	198.18	3.7–4.0	oxidizes
35	" penta-	V_2S_5	262.35	3.0	oxidizes
36	sulphate	$(VO)_2(SO_4)_3$	422.21		
37	**Xenon**	Xe	130.2	{ 63.5 D. 4.422 A.	−140°
38	**Ytterbium**	Yb	172.0		1800°
39	acetate	$Yb(C_2H_3O_2)_3.2H_2O$	421.13	2.09	$4H_2O$,100°
40	chloride	$YbCl_3.6H_2O$	386.48		150°–155°

* At 100 mm. Decomposes at 180°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	$5^{15°}$	decomp.	sol. $(NH_4)_2CO_3$aq., SO_2aq	yellow crystals
2	decomp.	$320^{18°}$	soluble	sol. alcohol, ether......	yellow crystals
3	118°	200	v. soluble	v. sol. al., ether, acet ..	yellow rhombic
4	....	insoluble	insoluble	insol. acetic acid.......	yellow rhombic
5	....	$7.4^{15°}$	decomp.	insoluble alcohol.......	yellow crystals
6	....	soluble	....	insoluble alcohol.......	yellow crystals
7	....	$16.6^{13.2°}$	$22.2^{100°}$	4 alcohol; sol. H_2SO_4...	yellow crystals
8	....	s. soluble	....	sol. al., conc. HCl......	brown........
9	....	s. soluble	soluble	insol. al.; sol. alk., NH_3aq.	yellow scales..
10	....	s. soluble	....	insol. al.; sol. NH_3aq...	brown amorph.
11	....	insoluble	insoluble	sol. HNO_3, HF, H_2SO_4	light gray crys.
12	....	soluble	....	....	gray b. amor-
13	....	....	....	sol. HNO_3...........	[phous
14	....	soluble	soluble	sol. alcohol, ether......	apple gr. hex.
15	....	soluble	....	sol. alcohol, ether......	pink tablets ..
16	154° [heat	soluble	....	sol. alcohol, ether......	red liquid ....
17	subl. red	insoluble	....	insol. al. $CHCl_3$, CS_2...	green.........
18	....	soluble	v. soluble	insol. ab. alcohol	rhombohedra..
19	....	soluble	....	sol. acetone; s. sol. al., $CHCl_3$	yellow........
20	111.2°	soluble	....	sol. al., $CHCl_3$; insol. CS_2	....
21	....	insoluble	insoluble	soluble dilute acids....	light gray crys.
22	....	s. soluble	soluble	sol. HF, HCl, hot conc.	black crystals.
23	....	insoluble	....	soluble a., alk.. .[H_2SO_4	blue crystals..
24	....	$0.8^{20°}$	....	soluble conc. a., alk....	yellow to red
25	....	soluble	....	....	brown [rhomb.
26	*	soluble	....	....	red liquid.....
27	....	insoluble	....	v. soluble HNO_3.......	brown powder
28	....	insoluble	....	soluble HNO_3.........	yellow cryst...
29	....	decomp.	....	soluble dil. HNO_3......	grassgreen tab.
30	127.19°	v. soluble	....	soluble alcohol........	yellow liquid..
31	....	insoluble	insoluble	insol. al., ether, benzine	metallic prisms
32	....	insoluble	insoluble	a.; sol. HF....[HNO_3	silvery prisms.
33	....	....	....	sol. hot conc. H_2SO_4,	black plates ..
34	....	....	....	sol. alk. sulphides, alk..	dark plates...
35	....	....	....	sol. alk. sulphides, alk..	black........
36	....	v. soluble	decomp.	soluble alcohol........	blue.........
37	−109.1°	28.4 c.c.$^{17°}$	....	....	....
38	....	....	....	....	....
39	....	v. soluble	v. soluble	....	hexag. plates .
40	$6H_2O$, 180°	soluble	....	sol. ab. al.............	green rhom. pr.

† Melts in electric arc.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	Ytterbium oxalate	$Yb_2(C_2O_4)_3.10H_2O$	788.16	2.644	....
2	oxide	Yb_2O_3	392.00	9.175	infusible
3	oxide hydrated	$Yb_2O_3.6H_2O$	500.10	....	....
4	selenate	$Yb_2(SeO_4)_3.8H_2O$	917.73	3.49	....
5	selenite	$Yb_2(SeO_3)_3$	715.60	....	....
6	sulphate	$Yb_2(SO_4)_3$	632.21	3.62	dec. 900°
7	"	$Yb_2(SO_4)_3.8H_2O$	776.34	$3.286^{20.6°}$	....
8	Yttrium	Yt	89.0	$3.80^{15°}$	1250°
9	bromate	$Y_2(BrO_3)_6,.18H_2O$	1287.808	....	780°
10	bromide	$YtBr_3$	328.76	....	....
11	"	$YtBr_3.9H_2O$	490.90	....	....
12	carbonate	$Yt_2(CO_3)_3.3H_2O$	412.05	....	....
13	chloride	$YtCl_3$	195.38	$2.8^{18°}$	160°
14	"	$YtCl_3.6H_2O$	303.48	2.575	dec. 100°
15	fluoride	$2YtF_3.H_2O$	310.02	....	....
16	hydroxide	$Yt(OH)_3$	140.02	....	decomp.
17	iodide	YtI_3	469.76	....	....
18	nitrate	$Yt(NO_3)_3.4H_2O$	347.09	2.682	....
19	"	$Yt(NO_3)_3.6H_2O$	383.13	....	decomp.
20	oxalate	$Yt_2(C_2O_4)_3.9H_2O$	604.14	....	decomp.
21	oxide	Yt_2O_3	226.00	$5.35^{18°}$	....
22	sulphate	$Yt_2(SO_4)_3$	466.21	2.612	dec. 1000°
23	"	$Yt_2(SO_4)_3.8H_2O$	610.34	2.558	$8H_2O$,450°
24	Zinc	Zn	65.37	$7.142^{16°}$	419°
25	acetate	$Zn(C_2H_3O_2)_2$	183.42	1.84	242°
26	"	$Zn(C_2H_3O_2)_2.3H_2O$	237.47	1.72	235°–257°
27	amide	$Zn(NH_2)_2$	97.42	....	dec. r. ht.
28	arsenate	$Zn_3(AsO_4)_2.8H_2O$	618.16	$3.309^{15°}$	....
29	bromate	$Zn(BrO_3)_2.6H_2O$	429.31	2.566	100°
30	bromide	$ZnBr_2$	225.21	4.219^{20}_{4}	394°
31	carbonate	$ZnCO_3$	125.37	4.42–4.45	CO_2, 300°
32	chlorate	$Zn(ClO_3)_2.6H_2O$	340.39	....	60°
33	chloride	$ZnCl_2$	136.29	2.91^{25}_{4}	262
34	cyanide	$Zn(CN)_2$	117.39	....	decomp.
35	ferrocyanide	$Zn_2Fe(CN)_6.3H_2O$	396.69	....	....
36	fluoride	ZnF_2	103.37	$4.612^{12°}$	734°
37	"	$ZnF_2.4H_2O$	175.43	$2.535^{12°}$	$4H_2O$,100°
38	hydroxide	$Zn(OH)_2$	99.39	3.053	decomp.
39	iodate	$Zn(IO_3)_2.2H_2O$	451.24	....	....
40	iodide	ZnI_2	319.21	4.696......	446°
41	nitrate	$Zn(NO_3)_2.6H_2O$	297.49	$2.065^{13°}$	36.4°
42	nitride	Zn_3N_2	224.13	....	....

* Sublimes in vacuo. † Loses $3H_2O$ at 100°.

Number.	Boiling Point, °C.	Solubility in 100 Parts. Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	0.000583	....	s. soluble dilute acids ..	crystalline....
2	....	insoluble	....	soluble hot dil. acids...	....
3	....	insoluble	....	v. sol. acids, KOH insol.	gelatinous ....
4	....	decomp.	soluble	..............[NH_3aq.	hexag. plates .
5	....	insoluble	....	....	....
6	....	$44.2^{0°}$	$4.67^{100°}$	....	....
7	....	soluble	s. soluble	....	prisms.......
8	....	sl. decomp.	decomp.	v. sol. dil. a., hot KOH	grayish black .
9	$12H_2O$,100°.	158	....	....	hexag. prisms
10	....	v. soluble	....	sol. al.; insol. ether....	....
11	....	v. soluble	....	sol. al.; insol. ether....	tablets.......
12	....	insoluble	....	s. sol. CO_2aq.; sol.	....
13	....	v. soluble	....	.........[$(NH_4)_2CO_3$aq	plates........
14	....	v. soluble	v. soluble	sol. al.; insol. ether....	rhombic prisms
15	....	insoluble	....	s. soluble acids........	gelatinous....
16	....	insoluble	....	insol. alk.; sol. a., NH_4Cl.	gelatinous....
17	....	v. soluble	....	sol. al.; s. sol. ether....	....
18	....	soluble	....	sol. conc. HNO_3.......	prisms.......
19	....	v. soluble	....	v. sol. al., ether.......	crystalline....
20	....	0.000137	....	s. sol. HCl...........	....
21	....	insoluble	....	sol. a.; insol. alk.......	crystalline....
22	....	1.52	s. soluble	sol. sat. K_2SO_4aq.......	....
23	....	9.3	$4.8^{100°}$	s. sol. H_2SO_4; insol. al...	monoclinic....
24	918°	insoluble	insoluble	sol. a., alk., $H.C_2H_3O_2$..	crystalline....
25	*	$30^{25°}$	$44.6^{100°}$	$2.8^{25°}$, $166^{79°}$ al........	mono. laminæ.
26	†	$40^{25°}$	$66.6^{100°}$	....	....
27	....	decomp.	....	dec. by al.; insol. ether.	amorphous ...
28	....	insoluble	....	sol. HNO_3, H_3AsO_4, alk.	mono. needles.
29	‡	100	v. soluble	....	regular.......
30	650°	$390^{0°}$	$670^{100°}$	v. sol. al., ether, NH_3aq.	needles.......
31	....	$0.001^{15°}$	insoluble	sol. a., alk., NH_4 salts..	rhombohedral.
32	decomp.	$652^{0°}$	∞	v. soluble alcohol......	.......[prisms
33	730°	$209^{0°}$	$616^{100°}$	$100^{12.5}$ al., v. sol. ether.	octahedral or
34	....	insoluble	....	insol. al.; sol. alk., KCN	orthorh. prisms
35	....	insoluble	....	insol. HCl; sol. NH_3aq..	....
36	....	s. soluble	soluble	insol. al.; sol. hot acids.	mono. needles.
37	....	$1.6^{18°}$	soluble	sol. NH_3aq., a., alk.....	....
38	....	$0.00042^{18°}$	insoluble	sol. acids, alkalies.....	rhombic prisms
39	....	0.877	1.32	sol. HNO_3, NH_3aq., alk.	....
40	624°	$430^{0°}$	$510^{100°}$	sol. a., $(NH_4)_2CO_3$aq....	octahedra....
41	§ 131°	$324.5^{0°}$	∞	v. soluble alcohol	tetragonal....
42	....	decomp.	....	....	gray.........

‡ Loses $6H_2O$ at 200. § Loses $6H_2O$ at 105°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A). H_2 = 1 (D).	Melting Point, °C.
1	**Zinc** oxalate........	$ZnC_2O_4.2H_2O$.......	189.04	*2.582$^{17.5°}$	....
2	oxide............	ZnO..............	81.37	5.78	....
3	oxide per-.........	ZnO_2..............	97.37	....	....
4	oxysulphide.......	$ZnO.ZnS$..........	178.81	....	....
5	permanganate.....	$ZnMnO_4.6H_2O$.....	292.40	....	$5H_2O$,100°
6	phosphate........	$Zn_3(PO_4)_2$..........	386.19	3.998$^{15°}$	red heat
7	"	$Zn_3(PO_4)_2.4H_2O$....	458.25	2.76–2.85	....
8	"	$Zn_3(PO_4)_2.8H_2O$....	530.41	3.109$^{15°}$	....
9	" acid....	$ZnH_4P_2O_8.2H_2O$....	295.51	....	....
10	" pyro-...	$Zn_2P_2O_7$..........	304.82	....	....
11	phosphide........	Zn_3P_2............	258.19	4.55$^{13°}$	....
12	salicylate.........	$Zn(C_7H_5O_3)_2.3H_2O$..	393.50	....	....
13	sulphate..........	$ZnSO_4$.............	161.44	3.6235$^{15°}$	dec. 600°
14	"	$ZnSO_4.7H_2O$.......	287.55	1.9661$^{16.2°}$	50° †
15	sulphate	$ZnSO_4.6H_2O$.......	269.54	2.07	....
16	sulphide..........	ZnS..............	97.44	3.98	1049°
17	" (blende) ..	ZnS..............	97.44	4.03–4.07	1049°
18	sulphite..........	$2ZnSO_3.5H_2O$......	380.96	....	....
19	**Zirconium**	Zr...............	90.6	4.15	1500°
20	"	Zr...............	90.6	6.40$^{18°}$	2350°
21	bromide..........	$ZrBr_4$.............	410.28	....	....
22	carbide..........	ZrC_2.............	114.60	....	....
23	chloride..........	$ZrCl_4$.............	232.44	....	....
24	fluoride..........	ZrF_4.............	166.60	4.4333$^{16°}$...	....
25	hydroxide........	$Zr(OH)_4$..........	158.63	3.25	$2H_2O$,550°
26	iodide...........	ZrI_4.............	598.28	....	....
27	nitrate...........	$Zr(NO_3)_4.5H_2O$.....	428.12	....	dec. 100°
28	oxalate..........	$Zr(C_2O_4)_2.2Zr(OH)_4$.	583.86	....	decomp.
29	oxide di-.........	ZrO_2.............	122.60	5	2500°
30	" "	ZrO_2.............	122.60	5.75$^{15°}$	2500°
31	" per-.........	ZrO_3.............	138.60	....	....
32	oxybromide.......	$ZrOBr_2.3H_2O$......	320.49	....	....
33	oxychloride.......	$ZrOCl_2.8H_2O$......	321.65	....	....
34	oxyiodide.........	$ZrI(OH)_3.3H_2O$.....	322.59	....	....
35	oxyiodide.........	$ZrI_2O.8H_2O$.......	504.57	....	decomp..
36	sulphate..........	$Zr(SO_4)_2.4H_2O$.....	354.80	....	....

* Anhydrous. † Loses $7H_2O$ at 280°; dec. at 600°.

Number.	Boiling Point, °C.	Solubility in 100 Parts: Cold Water.	Hot Water.	Alcohol (al.), Acids (a.), Alkalies (alk.), etc.	Crystalline Form and Color.
1	....	$0.00079^{18°}$	....	sol. acids, alk.........	....
2	....	0.001	....	sol. acids alk., NH_4Cl ..	yel. hexag. or
3	....	insoluble	....	decomp. by acids......	[amorphous
4	....	....	....	soluble HCl...........	yellow........
5	....	v. soluble	v. soluble	decomp. al., acids	dark blue crys.
6	....	insoluble	....	................[salts	....
7	....	insoluble	....	v. sol. a., NH_3aq., NH_4	prisms.......
8	....	insoluble	....	soluble alkalies........	rhombic plates
9	....	decomp.	....	....	triclinic......
10	....	insoluble	....	sol. a., alk., NH_3aq....	....
11	....	insoluble	....	sol. dil. acids..........	octahedrons ..
12	....	$5^{20°}$	....	soluble alcohol........	needles.......
13	....	$43.02^{0°}$	$95.03^{100°}$	s. soluble alcohol......	....
14	....	$115.2^{0°}$	$633.59^{100°}$	s. soluble alcohol......	rhomb. prisms or monoclinic
15	....	....	....	....	mono. or tetra.
16	subl. 1180°	0.00069	insoluble	v. sol. a.; insol. $H.C_2H_3O_2$	‡...........
17	subl. 1180°	0.000065	insoluble	soluble acids...[NH_3aq.	gray crystals..
18	....	0.16	decomp.	insol. al.; sol. H_2SO_3,	....
19	....	insoluble	insoluble	s. soluble acids, sol. HF.	black amorph.
20	....	insoluble	insoluble	soluble hot acids, HF..	gray crystals..
21	....	decomposes	....	....	crys. powder..
22	....	....	....	soluble dilute HF......	....
23	400°	soluble	decomposes	soluble alcohol........	....
24	white heat .	1.388	decomp.	soluble HF...........	hexagonal....
25	....	0.02	insoluble	sol. a.; insol. alk., al....	gelatinous....
26	....	soluble	soluble	sol. a., ether; s. sol. CS_2.	red br. crystals
27	....	soluble	decomp.	.........[insol. NH_3aq.	....
28	....	insoluble	....	sol. $(NH_4)_2C_2O_4$, HCl;	....
29	....	insoluble	....	sol. conc. H_2SO_4, HF...	amorphous....
30	....	insoluble	....	....	quad. prisms or
31	....	....	....	insol. cold dil. H_2SO_4...	[hexag.
32	....	soluble	....	....	needles.......
33	....	soluble	decomp.	soluble alcohol........	needles.......
34	....	v. soluble	....	....	amorphous ...
35	....	v. soluble	v. soluble	v. sol. ether	needles.......
36	....	soluble	$146^{39.5°}$	sol. H_2SO_4; insol. al....	crystalline....

‡ Yellow regular tetrahedral or hexagonal rhombohedral.

XXX.—PHYSICAL CONSTANTS

MOLECULAR WEIGHT, SPECIFIC GRAVITY, SOLUBILITY, MELTING

BY

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Abietic acid**	$C_{20}H_{30}O_2$	302.25	....
2	**Acenaphthen**	$C_{10}H_6(CH_2)_2$	154.08	1.0687^{95}_{95}
3	**Acetal**	$CH_3CH(OC_2H_5)_2$	118.12	0.8314^{20}_{4}
4	" (K.)	$CH_3CH(OC_2H_5)_2$	118.12	0.824^{25}_{25}
5	**Acet-aldehyde**	CH_3CHO	44.03	0.7876^{16}
6	" (K.)	CH_3CHO	44.03	0.79–0.795
7	aldoxine	CH_3CHNO	58.07	0.9645^{20}_{4}
8	amide	CH_3CONH_2	59.08	1.139
9	anilid	$CH_3CONH.C_6H_5$	135.11	1.2105^{4}
10	**Acetic acid**	$CH_3.CO_2H$	60.03	1.0515^{15}
11	" " (K.)	$CH_3.CO_2H$	60.03	1.048–1.049
12	" anhydride	$(CH_3CO)_2O$	102.05	1.0799^{15}

This table has been compiled by E. Emmet Reid, formerly Professor of Chemistry Baylor Univ., Texas, now Johnson Scholar Johns Hopkins Univ.

Most of the older data have been taken from standard works of reference. Many of these figures have been verified by reference to the original publications. The current journals have been thoroughly searched for the more recent data.

Nine specific gravities of solids and 103 approximate solubilities have been determined by the author.

The constants given in the lines preceded by the letter K. were determined for the Chemical Annual by C. A. F. Kahlbaum. In a few cases blanks in these have been filled in from the literature. Such data are enclosed in parenthesis.

The boiling points were determined by him under the following conditions:

1. The distilling flask was of such a size that it was about half filled with the substance being investigated. Whenever possible a metallic vessel was used, on account of the well-known tendency to superheating in glass vessels, especially with low-boiling liquids, such as aldehyde, pentane, acetone, methyl alcohol, etc. Ether, for example, boils in glass vessels as high as 50°. Whenever glass vessels were used a piece of asbestos paper having a circular hole of $\frac{1}{6}$–$\frac{1}{3}$ the diameter of the distilling flask, according to the boiling point of the substance investigated, was placed under the flask.

2. Heat was supplied by a pointed non-luminous flame without wire gauze. The size of the flame was regulated at the beginning of the experiment so that two drops of the distillate were produced per second. This

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	insoluble	v. soluble	v. soluble	182°	....	leaf. or monc.
2	....	3.2^{20}	....	95°	229.5° C.	rhombic/al..
3	5.2^{25}	∞	∞	....	102.91°	....
4	5.5	∞	∞	....	102–4°	....
5	∞	∞	∞	−124.6°	20.8°	....
6	∞	∞	∞	abt. −120°	20.5–24°	....
7	∞	∞	∞	47° or 13°	114–5°	....
8	97.5^{20}	25.0^{20}	v. soluble	82°	222° C.	hexagonal...
9	0.54^{25}	46.7^{25}	soluble	114.25° C.	305° C.	rhomb. lf/w.
10	∞	∞	∞	16.7°	118.1° C.	....
11	∞	∞	∞	....	117–8°	colorless.....
12	decomp. sol	∞	∞	....	137.9° C.	....

rate of distillation was maintained during the entire experiment. The distillation was discontinued when 90 to 93% of the liquid had been distilled off. The temperature was observed as soon as the first drops of the distillate fell from the condenser.

3. All boiling points refer to an atmospheric pressure of 760 mm. When the atmospheric pressure was abnormal, thermometers with movable scales were employed, water (B. P. 100°), aniline (B. P. 184°) and quinoline (B. P. 238°) being used as standard substances.

4. The boiling points given are the limits between which the greater part of the liquid distilled.

ABBREVIATIONS

The following abbreviations have been used in the table: abs. = absolute; acet. = acetone; al. = alcohol; amor. = amorphous; anhy. = anhydrous; at. = atmosphere; bz. = benzene; chlo. = chloroform; cryst. = crystalline; dec. = decomposes; et. = ether; exp. = explodes; hexag. = hexagonal; insol. = insoluble; leaf. = leaflets; lig. = ligroene; acet. = acetone; mod. = moderately; moncl. = monoclinic; need. = needles; pris. = prisms; quad. = quadratic; s. = slightly; sol. = soluble; subl. = sublimes; tab. = tablets; triclinic w. indicates that crystals separating from a water solution are triclinic in form; v. = very; w. = water; yel. = yellow; $265°^{100}$ indicates that the substance boils at 265° under a pressure of 100 mm.; a small figure to the right of a number denoting solubility signifies the temperature; ∞ = infinitely soluble or soluble in all proportions; $>$= greater than; $<$= less than.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Acetic anhydride**(K.)	$(CH_3CO)_2O$	102.05	1.0775^{25}_{25}
2	**Aceto-acetanilid** (K.)	$CH_3.CO.CH_2.CONHC_6H_5$	117.13	
3	**Aceto-acetic** acid	$CH_3CO.CH_2CO_2H$	102.05	
4	" ether	$CH_3CO.CH_2.CO_2C_2H_5$	130.08	1.0282^{20}_{4}
5	" " (K.)	$CH_3CO.CH_2CO_2C_2H_5$	130.08	1.024^{25}_{25}
6	**Acetol**	$CH_3CO.CH_2OH$	74.05	
7	**Acetone**	CH_3COCH_3	58.05	0.7970^{15}_{4}
8	" (K.)	CH_3COCH_3	58.05	0.788–0.790
9	**Aceto-phenone**	$CH_3CO.C_6H_5$	120.06	1.0329^{15}_{15}
10	" (K.)	$CH_3CO.C_6H_5$	120.06	1.028^{25}_{25}
11	**Acetoxime**	$(CH_3)_2C:NOH$	73.10	$0.8868^{7.5}_{4}$
12	**Acet-o-toluid**	$CH_3CONHC_5H_4.CH_3$	149.13	1.168^{15}
13	**Acetyl-acetone**	$CH_3COCH_2COCH_3$	100.06	0.987^{15}
14	bromide	CH_3COBr	122.99	
15	chloride	CH_3COCl	78.48	1.1051^{20}_{4}
16	**Acetylene**	$H_2C:C:$	26.02	$.91(A).613^{-80}$
17	dicarbonic acid	$CO_2H.C\vdots C.CO_2H+2H_2O$	150.05	
18	tetrabromide (K.)	$CHBr_2.CHBr_2$	345.86	2.97^{15}_{15}
19	tetrachloride (K.)	$CHCl_2.CHCl_2$	167.82	1.582^{25}_{25}
20	**Acetyl fluoride**	CH_3COF	62.03	1.0369^{0}
21	iodide	CH_3COI	170.00	1.98^{17}
22	methyl-hexyl ketone(K)	$CH_3CO.CH_2CO.C_6H_{13}$	170.14	0.907^{25}_{25}
23	peroxide	$(CH_3CO)_2O_2$	118.05	
24	propyl alcohol	$CH_3CO.(CH_2)_2CH_2OH$	102.08	1.0159^{0}
25	rosaniline	$C_{20}H_{18}(C_2H_3O)N_3$	343.29	
26	urea	$NH_2.CO.NHC_2H_3O$	102.13	
27	**Aconic** acid	$C_5H_4O_4$	128.03	
28	**Aconitic** acid	$C_3H_3(CO_2H)_3$	174.05	
29	**Acridine**	$C_6H_4<\genfrac{}{}{0pt}{}{CH}{N}>C_6H_4.$	179.11	
30	**Acrolein**	$CH_2:CH.CHO$	56.03	0.84
31	**Acrylic** acid	$CH_2:CH.CO_2H$	72.03	1.0621^{16}_{4}
32	**Adipic** acid	$CO_2H.(CH_2)_4.CO_2H$	146.08	
33	**Aldehyde** ammonia	$CH_3.CH(OH).NH_2$	61.10	
34	benzoic acid (o.)	$CO_2H.C_6H_4CHO$	150.05	1.404
35	" " (m.)	$CO_2H.C_6H_4CHO$	150.05	
36	" " (p.)	$CO_2H.C_6H_4CHO$	150.05	
37	**Aldehydine**	$2,5CH_3.C_5H_3N.C_2H_5$	121.13	0.9184^{23}
38	**Aldol**	$CH_3.CH(.OH)CH_2COH$	21.06	1.1094^{16}
39	**Alizarine**	$C_6H_4(CO)_2C_6H_2(OH)_2$	240.06	

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	sol. dec	∞	∞	....	137–40°	colorless.....
2	v. s. sol.	soluble	soluble	84.5–5°	....	sm. flat pris.
3	∞	....	∞	....	decomp.	....
4	s. soluble	∞	∞	< −80°	181.5°	....
5	s. soluble	∞	∞	....	177–81°	becomes yel.
6	∞	∞	∞	....	147° dec.	....
7	∞	∞	∞	−94.6°	56.53° C.	....
8	∞	∞	∞	−95°	56–7°	....
9	insoluble	soluble	soluble	20.5°	202° C.	leaflets
10	v. s. sol.	soluble	∞	17–19°	199–202°	usually yel...
11	v. soluble	v. soluble	v. soluble	60°	135°	prisms......
12	0.86^{19}	8.08	....	110°	296°	orthorhombic
13	12.5	∞	∞	....	$139°^{746}$	....
14	decomp.	decomp.	soluble	....	81°	....
15	decomp.	decomp.	soluble	....	50.9° C.	....
16	0.118 g.^{12}	600 c.c.^{18}	....	−81.5°	−83.6°	....
17	v. soluble	v. soluble	v. soluble	178–9°	....	crystalline...
18	insoluble	soluble	∞	....	239–42° d.	wh. → yel....
19	insoluble	∞	∞	....	145–7°	colorless.....
20	5 c.c.	reacts	∞	< −55°	$10.5°^{750}$	....
21	decomp.	decomp.	soluble	....	108°	brown.......
22	v. s. sol.	∞	∞	−6°	234–7° dec.	wh. → yel....
23	sl. soluble	dec. NaOH	∞	30°	$63°^{21}$	plates.......
24	∞	v. soluble	v. soluble	....	208–9°	....
25	insoluble	soluble	insoluble†	....	....	red.........
26	v. sol. hot	1^{20}; 10^{77}	....	218–9°	....	....
27	17.6^{15}	sol. CH_3OH	....	164°	dec.	triclinic/w...
28	18	50^{12}	s. soluble	191° dec.	....	leaflets......
29	s. soluble	v. soluble	v. soluble	107°	>360° sub.	rhomb. leaf..
30	40	soluble	soluble	....	52.4°	....
31	∞	....	....	8°	140°	....
32	1.4^{15}	v. soluble	0.605^{15}	153° C.	$265°^{100}$	triclinic nd...
33	v. soluble	v. soluble	s. soluble	70–80°	100°	rhomboh.....
34	v. soluble	v. soluble	v. soluble	97.2°	dec.	moncl.leaf./w
35	....	....	....	164–6°	....	sm. needles..
36	sol. hot	v. soluble	s. soluble	285°	sub.	needles/w....
37	insoluble	v. soluble	v. soluble	....	173–4°	....
38	∞	∞	soluble	....	$90–105°^{20}$	thick syrup..
39	0.034^{100}	v. soluble*	v. soluble	289–90°	430°	red triclinic..

* Soluble CS_2, KOH. † Soluble Chloroform, CS_2.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
	Alizarine			
1	β-carbonic acid	$CO_2H.C_6H_3(CO)_2C_6H_2$	284.06	
2	**Allantoin**	$C_4H_6N_4O_3$ .... $[(OH)_2$	158.21	
3	**Alloxan**	$C_4H_2N_2O_4+1$ or $4H_2O$	142.10	
4	**Allyl acetate**	$CH_3.CO_2.C_3H_5$	100.06	0.9376^{0}
5	acetic acid	$CH_2:CH.(CH_2)_2CO_2H$	100.06	0.9843^{18}_{4}
6	**Allyl acetone**	$CH_3.CO.CH_2.C_3H_5$	98.08	0.834^{27}
7	alcohol	$CH_2:CH.CH_2OH$	58.05	0.8491^{25}_{25}
8	" (K.)	$CH_2:CH.CH_2OH$	58.05	$0.854\text{-}0.857^{15}_{15}$
9	amine	$CH_2:CH.CH_2.NH_2$	57.10	0.7688^{15}
10	aniline	$C_6H_5.NH.C_3H_5$	133.13	0.982^{25}
11	benzene	$C_6H_5.CH:CH.CH_3$	118.08	0.9143^{15}_{15}
12	benzoate	$C_6H_5.CO_2.C_3H_5$	162.08	1.0578^{15}_{15}
13	bromide	$CH_2:CH.CH_2Br$	121.00	1.436^{15}
14	butyrate	$CH_3(CH_2)_2.CO_2.C_3H_5$	128.10	
15	chloride	$CH_2:CH.CH_2Cl$	76.49	0.9371^{19}
16	cinnamate (K.)	$C_6H_5.CH:CH.CO_2.C_3H_5$	188.10	1.052^{25}_{25}
17	cyanide	$CH_2:CH.CH_2CN$	67.08	0.8351^{15}
18	ether	$(CH_2:CH.CH_2)_2O$	98.08	0.8046^{18}
19	formate	$HCO_2.C_3H_5$	86.05	$0.9322^{17.5}$
20	iodide	$CH_2:CH.CH_2I$	168.01	1.8293^{23}
21	isoamyl ether	$C_3H_5.O.C_5H_{11}$	128.13	
22	isobutyrate	$C_4H_7O_2.C_3H_5$	128.10	
23	isocyanide	$C_3H_5.NC$	67.08	0.794^{17}
24	isovaleriate	$C_5H_9O_2.C_3H_5$	142.12	
25	mercaptan	$CH_2:CH.CH_2SH$	74.11	
26	mustard oil	$CH_2:CH.CH_2NCS$	99.14	1.0173^{10}
27	oxalate	$C_2O_4(C_3H_5)_2$	170.08	1.055^{15}
28	phenyl ether	$C_6H_5.OC_3H_5$	134.08	0.9856^{15}_{15}
29	phenyl urea	$C_3H_5HN.CO.NHC_6H_5$	176.18	
30	pyridine (α)	$C_3H_5.C_5H_4N$	119.11	0.9595^{0}
31	sulphide	$(CH_2:CH.CH_2)_2S$	114.14	0.8877^{4}
32	sulphocyanide	$C_3H_5.SCN$	99.14	1.056^{15}
33	**Allylene**	$CH_3.C:CH$	40.03	
34	oxide	$CH_3.(C:CH)O$	56.03	
35	**Aluminum ethyl**	$Al(C_2H_5)_3$	114.22	
36	methyl	$Al(CH_3)_3$	72.17	
37	**Amarin**	$C_{21}H_{18}N_2+\frac{1}{2}H_2O$	307.24	
38	**Amaron**	$(C_6H_5)_2(C.N.C)_2(C_6H_5)_2$	384.24	
39	**Amino-acetone**	$NH_2CH_2.CO.CH_3$	73.10	
40	acetophenone (p.) (K.)	$NH_2.C_6H_4.CO.CH_3$	135.11	

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	s. soluble	mod. sol.	s. soluble	305°	sub.	red need....
2	0.6^{20} v.s. h.	v. v. s. sol.	insol.	....	dec.	monocl. pris..
3	v. soluble	soluble	....	dec.	170°(?)	triclinic/w...
4	s. soluble	∞	∞	....	103–4°^{734}	....
5	s. soluble	v. soluble	v. soluble	< −18°	188° C.	....
6	insoluble	....	....	....	128–30°	....
7	∞	∞	∞	−129°	96.69° C.	....
8	∞	∞	∞	....	95–7°	....
9	∞	soluble	∞	....	56.5°^{756}	....
10	v. s. sol.	soluble	....	....	208–9°	yellow oil....
11	....	soluble	....	....	176–7°C.	....
12	....	....	....	....	230°^{768}	....
13	insoluble	soluble	soluble	....	70–1°	....
14	....	soluble	....	....	142°	....
15	insoluble	soluble	∞	....	46°	....
16	insoluble	v. soluble	∞	....	284–6° dec.	wh.→yel....
17	....	soluble	....	....	119° C.	....
18	s. soluble	∞	∞	....	94.3°	....
19	....	soluble	....	....	83.6°C.^{768}	....
20	insoluble	soluble	....	....	102.5–2.8c	....
21	....	....	....	....	120°	....
22	....	....	....	....	133.5°	....
23	s. soluble	soluble	....	....	96–106°	....
24	....	....	....	....	154–5°	....
25	....	....	....	....	90°	....
26	v. s. soluble	v. soluble	v. soluble	....	150.7°	....
27	insoluble	soluble	....	....	217°	....
28	insoluble	....	....	....	191.7° C.	....
29	....	....	sol. bz.	115.5°	....	thick needles.
30	....	....	....	....	189–90°	....
31	s. soluble	∞	∞	....	138.6°^{758}	....
32	insoluble	....	....	....	161°.....	....
33	....	....	3000 c.c.	−110°	−23.5°*	....
34	s. soluble	....	....	....	62–3°	....
35	dec.	....	....	< −18°	194°	....
36	....	....	....	0°	130°	....
37	insoluble	v. soluble	v. soluble	130–1°anhy	....	prisms......
38	insoluble	s. sol. hot	s. soluble	245–6°	subl.	sm. need./ace
39	v. soluble	soluble	....	188–9° dec.	....	need.or tab/al
40	v. s. sol.	soluble	soluble	105.5–6°	....	yel. flat pris..

* Liquefies at 3 to 4 atmospheres pressure.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
	Amino-			
1	anthraquinone	$C_{14}H_9O_2.NH_2$	223.07	
2	azo-benzene (p.)	$NH_2.C_6H_4.N_2.C_6H_5$	197.21	
3	azo-naphthaline	$C_{10}H_7.N_2.C_{10}H_6NH_2$	297.24	
4	benzaldehyde (o.)	$C_6H_4.CHO.NH_2$	121.10	
5	benzamide (o.)	$NH_2.C_6H_4.CONH_2$	136.14	
6	" (m.)	$NH_2.C_6H_4.CONH_2$	136.14	
7	" (p.)	$NH_2.C_6H_4.CONH_2$	136.14	
8	benzene-sulphonic ac.o.	$NH_2.C_6H_4.SO_3H+\frac{1}{2}H_2O$	182.17	
9	" (m.)	$NH_2.C_6H_4.SO_3H+1\frac{1}{2}H_2O$	200.19	
10	benzoic acid (o.)	$NH_2.C_6H_4.CO_2H$	137.10	
11	" " (m.)	$NH_2.C_6H_4.CO_2H$	137.10	1.5104^{4}
12	" " (p.)	$NH_2.C_6H_4.CO_2H$	137.10	
13	cinnamic acid (o.)	$NH_2.C_6H_4.C_2H_2CO_2H$	163.11	
14	" " (m.)	$NH_2.C_6H_4.C_2H_2CO_2H$	163.11	
15	" " (p.)	$NH_2.C_6H_4.C_2H_2CO_2H$	163.11	
16	diphenyl (o.)	$C_6H_5.C_6H_4.NH_2$	169.13	
17	" (p.)	$C_6H_5.C_6H_4.NH_2$	169.13	
18	ethyl-benzene (o.)	$C_2H_5.C_6H_4.NH_2$	121.13	0.983^{22}
19	" (m.)	$C_2H_5.C_6H_4.NH_2$	121.13	0.9896^{0}
20	" (p.)	$C_2H_5.C_6H_4.NH_2$	121.13	0.975^{22}
21	β-naphthol (1)	$NH_2.C_{10}H_6.OH$	159.11	
22	phenol (o.)	$NH_2.C_6H_4.OH$	109.10	
23	" (m.)	$NH_2.C_6H_4.OH$	109.10	
24	" (p.)	$NH_2C_6H_4.OH$	109.10	
25	quinoline (2)	$C_9H_6N.NH_2$	144.14	
26	" (4)	$C_9H_6N.NH_2+H_2O$	162.16	
27	salicylic acid (5)	$NH_2.C_6H_3(OH)CO_2H$	153.10	
28	thiophene	$NH_2C_4H_3S$	99.14	
29	triphenyl-methane	$(C_6H_5)_2CH.C_6H_4NH_2$	259.18	
30	**Ammelid**	$C_6H_9N_9O_3$	255.43	
31	**Ammelin**	$C_3H_5N_5O$	127.24	
32	**Amygdaline**	$C_{20}H_{27}NO_{11}+3H_2O$	511.31	
33	**Amygdalinic acid**	$C_{20}H_{28}O_{13}$	476.22	
34	**Amyl acetate**	$CH_3CO_2.C_5H_4$	130.12	0.8748^{19}
35	alcohol (n.)	$CH_3(CH_2)_3.CH_2OH$	88.10	0.8168^{20}
36	" (act.)	$CH_3(C_2H_5)CH.CH_2OH$	88.10	0.8169^{18}
37	" (sec.)	$C_3H_7.CH(OH).CH_3$	88.10	0.8239^{0}
38	" (tert.)	$(CH_3)_2.C(OH).C_2H_5$	88.10	0.8144^{15}
39	amine	$CH_3(CH_2)_4.NH_2$	87.15	0.7662^{19}

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	v. sol. chlo.*	s. soluble	v. sol. acet.	256°	subl.	red powder. .
2	v. s. sol. hot	v. sol. hot	v. soluble	127.4°	>360°	monoclinic. . .
3	. . . .	mod. sol.	mod. sol.	173–5°	dist.	red needles . .
4	s. soluble	v. v. sol.	v. v. sol.	39–40°	dec.	leaflets
5	mod. sol.	v. soluble	s. soluble	108°	. . . .	leaflets/chlo. .
6	s. soluble	soluble	soluble	79°	abt. 300°	yel. moncl.
7	s. soluble	. . . .	. . . .	182.9° C.	. . . .	bright yellow
8	1.5^{15}	soluble	. . . .	. . . .	. . . .	quad. prisms.
9	1.99^{9}	soluble	. . . .	. . . .	. . . .	triclinic pris .
10	0.34^{14}	10.7^{9}	16.0^{7}	144–5°	subl. in vac.	trimet.leaflets
11	0.56^{14}	2.2^{9}	1.81^{6}	174°	. . . .	cryst. warts
12	0.34^{14}	11.3^{9}	8.21^{6}	186–7°	. . . .	red yel. cryst
13	v. s. sol.	mod. sol.	mod. sol.	158–9° dec	. . . .	yellow need. .
14	s. soluble	soluble	soluble	180–1°	. . . .	lg. yel. need. .
15	s. soluble	v. soluble	v. soluble	175–6° dec	. . . .	fine yel. need.
16	insoluble	soluble	. . . .	49°	299°	leaflets. . . . . .
17	s. soluble	v. soluble	v. soluble	53°	302° C.	glit. leaf/al. .
18	. . . .	. . . .	. . . .	< −10°	215–6° C.	. . . .
19	. . . .	. . . .	. . . .	. . . .	214–5°	. . . .
20	. . . .	. . . .	. . . .	−5°	216–6.5° C	glit. leaflets. .
21	v. s. sol. hot	. . . .	sol. fluoresc	. . . .	. . . .	leaflets. . . . . .
22	1.7^{0}	4.5^{0}	v. soluble	170°	subl.	rhombic.
23	2.6^{20}	soluble	soluble	122–3°	. . . .	pris./toluene
24	1.1°	4.5^{0}	s. soluble	184° dec.	sub. pt.	leaflets
25	v. v. s. sol.	v. soluble	v. soluble	129° C.	. . . .	lrg. leaf./w. . .
26	soluble	soluble	sol. acet.	69–70° (anh. 154°)	. . . .	fine need./w
27	insoluble	insoluble	. . . .	dec.	dec.	glit. needles. .
28	v. soluble	v. soluble	insoluble	. . . .	. . . .	oil. . . . .
29	sol. lig.	sol. bz.	soluble	83–4°	. . . .	pris. lg. or et .
30	insoluble	insoluble	sol. acid	. . . .	. . . .	powder. . . . . .
31	0.02	insoluble	sol. KOH	dec.	. . . .	needles. . . . . .
32	8^{10}, ∞^{100}	0.11^{10}, $9.^{78}$	insoluble	214–6°	. . . .	tetra. pris./w.
33	deliq.	insoluble	v. s. sol.	. . . .	. . . .	cryst. mass. .
34	0.18^{20}	∞	∞	thick–75° .	148°	. . . .
35	2.7^{22}	∞	∞	. . . .	137.8°	. . . .
36	. . . .	. . . .	. . . .	. . . .	129.3° C.	. . . .
37	16	. . . .	. . . .	. . . .	118.5^{0753}	. . . .
38	s. soluble	soluble	soluble	−12°	101.81°	. . . .
39	. . . .	soluble	. . . .	. . . .	104°	. . . .

* Very soluble benzene.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Amyl** benzene	$C_6H_5.C_5H_{11}$	148.13	0.8602^{22}
2	bromide	$CH_3.(CH_2)_3CH_2Br$	151.05	1.2234^{20}
3	" tert. (K.)	$CH_3.CH_2.CBr(CH_3)_2$	151.05	$1.194^{\frac{25}{25}}$
4	chloride	$CH_3(CH_2)_3CH_2Cl$	106.54	0.8834^{20}
5	" tert. (K.)	$CH_3.CH_2CCl(CH_3)_2$	106.54	$0.862^{\frac{25}{23}}$
6	cyanide	$(C_2H_5)_2CHCN$	97.13	0.866^{20}
7	ether (K.)	$(C_5H_{11})_2O$	158.18	$0.7745^{\frac{25}{25}}$
8	formate	$CHO_2C_5H_{11}$	116.10	0.9018^{0}
9	iodide	$CH_3.(CH_2)_3.CH_2I$	198.06	1.5174^{20}
10	isobutyrate	$C_4H_7O_2.C_5H_{11}$	158.15	0.8592^{13}
11	phthalate (K.) (o.)	$C_6H_4(CO_2C_5H_{11})_2$	306.21	$1.019^{\frac{25}{25}}$
12	succinate (K.)	$<(CH_2)_2: (CO_2.C_5H_{11})_2$	258.21	$0.952^{\frac{25}{25}}$
13	valeriate	$C_4H_9.CO_2.C_5H_{11}$	172.16	0.8812^{0}
14	**Amylene** n.	$CH_3.(CH_2)_2CH: CH_2$	70.08	....
15	**Amylene**	$C_2H_5.CH: CH.CH_3$	70.08	....
16	**Amylene** (K.)	$(CH_3)_2C: CHCH_3$	70.08	$0.666^{\frac{15}{15}}$
17	**Anethol** (p.)	$CH_3.CH: CH.C_6H_4.O.CH_3$	148.10	$0.9936^{\frac{15}{15}}$
18	**Angelic acid**	$C_4H_7CO_2H$	100 06	$0.9539^{\frac{76}{4}}$
19	**Aniline**	$C_6H_5.NH_2$	93.10	$1.0254^{\frac{15}{15}}$
20	" (K.)	$C_6H_5.NH_2$	93.10	$1.0214^{\frac{25}{25}}$
21	**Anisalcohol** (p.)	$CH_3O.C_6H_4.CH_2OH$	138.08	$1.1129^{\frac{15}{15}}$
22	**Anisic acid** (p.)	$CH_3O.C_6H_4CO_2H$	152.06	1.364^{4}–1.385
23	aldehyde (p.)	$CH_3O.C_6H_4CHO$	136.06	$1.1260^{\frac{15}{15}}$
24	" (K.) (p.)	$CH_3O.C_6H_4.CHO$	136.06	$1.120–1.122^{\frac{25}{25}}$
25	**Anisol**	$C_6H_5.O.CH_3$	108.06	$0.9988^{\frac{15}{15}}$
26	" (K.)	$C_6H_5.O.CH_3$	108.06	$0.9925^{\frac{25}{25}}$
27	**Anisyl chloride** (K.) (p.)	$CH_3O.C_6H_7.COCl$	170.51	....
28	**Anthracene**	$C_6H_4:(CH)_2: C_6H_4$	178.08	1.147
29	carbonic acid (α)(9)	$C_6H_4: CHC(CO_2H): C_6H_4$	222.08	....
30	" " (1)	$C_6H_4:(CH_2)_2: C_6H_3.CO_2H$	222.08	....
31	" " (γ.)	$C_6H_4: (CH_2)_2: C_6H_3.CO_2H$	222.08	....
32	**Anthramine**	$C_6H_4:(CH)_2: C_6H_3.NH_2$	193.13	....
33	**Anthranil**	$C_6H_4: NH.CO$	119.08	....
34	**Anthrapurpurin**	$C_{14}H_5O_2(OH)_3 1:2:7$	256.06	....
35	**Anthraquinoline**	$C_{17}H_{11}N$	229.13	....
36	**Anthraquinone**	$C_6H_4:(CO)_2: C_6H_4$	208.06	1.419–1.438
37	carbonic acid (β)	$C_6H_4:(CO)_2: C_6H_3CO_2H$	252.06	....
38	dicarbonic acid (1, 3)	$C_{16}H_8O_5$	280.06	....
39	**Anthrol** (m.)	$C_6H_4(CH)_2C_6H_3OH$	194.08	....
40	**Antimony pentamethyl**	$Sb(CH_3)_5$	195.32	....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	soluble	....	....	$201^{\circ 743}$	....
2	....	soluble	....	....	$128.7^{\circ 739}$	....
3	insol. dec.	∞	∞	....	108–11° de.	wh.→yel....
4	....	soluble	....	....	$106.6^{\circ 740}$	....
5	insol. dec.	∞	∞	....	85–9°	colorless ....
6	s. soluble	∞	∞	....	$176–7^{\circ 764}$	....
7	insoluble	∞	∞	....	169–72°	yellowish....
8	s. soluble	∞	∞	thick–75°	130.4°	....
9	....	soluble	....	....	$155.4^{\circ 739}$	....
10	s. soluble	....	....	....	153–5°	....
11	insoluble	∞	∞	....	338–44°	yellow
12	insoluble	∞	∞	....	289–93°	wh. → yel.
13	s. soluble	∞	∞	thick – 75°	203.7°	....
14	....	....	....	....	39–40°	....
15	....	....	....	....	$36^{\circ 741}$	....
16	v. s. sol.	soluble	∞	....	37–42°	....
17	v. s. sol.	∞	∞	22.5°	$235.2^{\circ 760}$	leaflets
18	s. soluble	soluble	v. soluble	45.5°	185°	monoclinic
19	3.607^{25}	∞	∞	– 5.96°	183.7° C.	....
20	$3.22^{12.5}$	soluble	∞	– 6–5°	183–4°	becomes br'n
21	insoluble	....	....	45°	258.8°	needles
22	0.04^{18}	v. soluble	soluble	184.2° C.	275–80°	moncl. prisms
23	s. soluble	∞	∞	0°	248° C.	....
24	s. soluble	soluble	∞	....	247–50°	usually yel...
25	insoluble	soluble	soluble	– 37.8° C.	155–5.6°	....
26	insoluble	soluble	∞	– 37.8°	153–5°	....
27	insol. dec.	sol. dec.	soluble	26–7°	....	sm. needles
28	insoluble	0.59^{15}	1.17^{15}	216.55° C.	$360, 103–4^{\circ 0}$	moncl. leaf.
29	v. v. s. sol.	v. soluble	....	206° dec.	dec.	yel. need./al.
30	insoluble	s. soluble	s. soluble	245°	subl.	yel. need./al.
31	insoluble	soluble	soluble	280° abt.	subl.	sm. yel leaf/al.
32	v. v. s. sol.	s. soluble	s. soluble	238°	....	yel. need. /al.
33	s. soluble	v. soluble	....	18°	210–15 dec.	oil..........
34	s. sol. hot	v. soluble	s. soluble*	> 330°	462° C.	lg. or need./al.
35	insoluble	v. soluble	v. soluble	170°	446°	leaf. or tablets
36	0.536^{20} acetone	0.05^{10} 2.3^{70}	s. soluble	284.65° C.	380° C.	tetrag. yel. need.
37	....	v. s. sol.	v. v. s. sol.	290–2°	subl.	yel. pris./al..
38	v. v. s. sol.	v. soluble	....	> 330°	....	yel. needles..
39	sol. acetone	v. soluble	v. soluble	....	200° dec.	need. or leaf/a
40	insoluble	....	....	....	96–100°	....

* Slightly soluble chloroform; insoluble benzene.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Antimony** triethyl	$Sb(C_2H_5)_3$	207.32	1.3244^{16}
2	trimethyl	$Sb(CH_3)_3$	165.27	1.523^{15}
3	**Antipyrene**	$C_{11}H_{12}N_2O$	188.18	
4	**Apple oil** see Isoamyl-			
5	isovaleriate			
6	**Arabin**	$C_{10}H_{18}O_9$	282.15	
7	**Arabinose** (d.)	$OHCH_2(CHOH)_3CHO$	150.08	
8	" (l.)	$OHCH_2(CHOH)_3CHO$	150.08	
9	**Arabite** (d.)	$CH_2OH.(CHOH)_3CH_2OH$	152.10	
10	**Arachidic** acid	$C_{20}H_{40}O_2$	312.32	
11	**Arbutin**	$C_{12}H_{16}O_7 + \frac{1}{2}H_2O$	281.14	
12	**Arsenic-diethyl**	$[As(C_2H_5)_2]_2$	266.16	1.+
13	**Asparagine** (l.)	$C_2H_3.NH_2CO_2HCONH_2$	132.14	$1.5434^{\frac{15}{4}}$
14	**Atronic** acid	$C_{17}H_{14}O_2$	250.12	
15	**Atropic** acid	$CH_2: C(C_6H_5).CO_2H$	148.06	
16	**Aurine**	$C_{19}H_{14}O_3$	290.12	
17	**Azelaic** acid	$CO_2H.(CH_2)_7.CO_2H$	188.13	
18	**Azobenzene**	$C_6H_5.N_2.C_6H_5$	182.16	1.203
19	**Azobenzoic** acid (o.)	$(CO_2H.C_6H_4)_2.N_2$	270.16	
20	" " (m.)	$(CO_2H.C_6H_4)_2.N_2 + \frac{1}{2}H_2O$	279.17	
21	" " (p.)	$(CO_2H.C_6H_4)_2.N_2 + \frac{1}{2}H_2O$	279.17	
22	**Azonaphthaline** ($\alpha\alpha$)	$C_{10}H_7.N: N.C_{10}H_7$	282.20	
23	**Azophenetol** (o.)	$(C_2H_5.O.C_6H_4)_2N_2$	270.23	
24	" (p.)	$(C_2H_5.O.C_6H_4)_2N_2$	270.23	
25	**Azophenol** (o.)	$(OH.C_6H_4)_2N_2$	214.16	
26	" (m.)	$(OH.C_6H_4)_2N_2$	214.16	
27	" (p.)	$(OH.C_6H_4)_2N_2$	214.16	
28	**Azotoluene** (oo.)	$(CH_3C_6H_4)_2N_2$	210.20	
29	" (mm.)	$(CH_3C_6H_4)_2N_2$	210.20	
30	" (pp.)	$(CH_3C_6H_4)_2N_2$	210.20	
31	**Azoxybenzene**	$(C_6H_5)_2: N_2O$	198.16	$1.248^{\frac{20}{20}}$
32	**Azoxybenzoic** acid (o.)	$(CO_2H.C_6H_4)_2N_2O$	286.16	
33	" " (m.)	$(CO_2H.C_6H_4)_2N_2O$	286.16	
34	" " (p.)	$(CO_2H.C_6H_4)_2N_2O$	286.16	
35	**Barbituric** acid	$CO:(NH.CO)_2:CH_2+2H_2O$	164.05	
36	**Bebeerine**	$C_{18}H_{21}NO_3$	299.21	
37	**Behenic** acid	$C_{22}H_{44}O_2$	340.33	
38	**Behenolic** acid	$C_8H_{17}C⁝C(CH_2)_{11}CO_2H$	336.32	

* Soluble KOH. † Soluble benzene.

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	insoluble	soluble	soluble	....	$158.5^{\circ 730}$	....
2	s. soluble	insoluble	soluble	....	·80.6°	..[moncl./w.
3	v. soluble	v. soluble	sl. soluble	113°	319° C.^{174}	leaf. et.:
4						
5						
6	soluble	insoluble	....	....	....	amorphous..
7	59^{10}	0.46^{10}90%	....	158.5–9.5°	....	rhombic pris.
8	59.3^{10};300^{100}	0.42^{9}/90%	insoluble	158.5-9.5°C	....	rhombic/al..
9	v. soluble	2.08^{12}90%	....	103° C.	....	warts
10	insoluble	s. soluble	v. soluble	77°	....	leaflets......
11	v. sol. hot	soluble	v. v. s. sol.	165–6°	....	silky needles.
12	insoluble	soluble	soluble	....	185–90°	....
13	0.62^{20} 53^{100}	v. s. sol.	v. s. sol.	234–5°	dec.	long rhombic
14	v. v. s. sol.	v. soluble	....	164°	....	pris./acet. amor./w.
15	0.14^{19}	soluble....	v. sol. CS_2	106–7°	267°	moncl. tab.al.
16	insoluble	soluble	sol,solKOH	abt. 220°	....	red rhombic.
17	0.24^{20}–2.2^{65}	v. soluble	v. soluble	106.5°	abt.360 dec.	leaf., needles.
18	insoluble	8.5^{20}	sol., v. sol. lig.	68.1°	295–$7^{\circ 749}$ C.	or. yel.moncl. leaf.
19	s. soluble	mod. sol.	v. soluble	250–1°	....	yel. needles..
20	v. s. sol.	s. soluble	s. soluble	dec.	....	amor. powder
21	insoluble	insoluble	insoluble	dec.	dec.	reddish amor.
22	insoluble	s. soluble	sol. acet.†	186°	subl.	red need. acet.
23	insoluble	soluble	sol.,sol.HCl	131°	240° dec.	red pris./al...
24	insoluble	s. soluble	v. soluble	160°	dist.	orange leaf ...
25	insoluble	0.33	v. soluble*	171°	subl.	yel. leaflets..
26	v. s. sol.	s. sol. hot	s. soluble	205°	....	leaf./dil. al...
27	s. soluble	v. soluble	v. soluble†	204°	....	brown triclin.
28	insoluble §	6.03^{14}	147^{16}	55°	....	red moncl./et.
29	insoluble	v. soluble	v. soluble	54–5°	....	or. red rhomb.
30	insoluble	mod. sol.	v. soluble	144°	....	monocl. pris.
31	insoluble	11.4^{15}	soluble	36°	dec.	yel. rhombic.
32	v. s. sol.	mod. sol.	mod. sol.	248°	dec.	yel. triclin.
33	insoluble	s. soluble	s. soluble	345°	....	mic. needles .
34	....	insoluble	sol. pyridin	no m. p.	dec. 330°	yellow prisms
35	s. soluble	....	....	dec.	....	rhombic.....
36	0.016	20 abs.‡	8	214°	....	pris. meth. al.
37	insoluble	0.102^{17}	1.92^{16}	84°	....	needles
38	insoluble	v. soluble	sol. chlo...	57.5°	....	need./abs. al.

‡ Soluble acetone and chloroform. § Very soluble benzene.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Benzal** chloride	$C_6H_5.CHCl_2$	160.95	1.295^{16}
2	“ “ (K.)	$C_6H_5.CHCl_2$	160.95	1.248^{25}_{25}
3	**Benzalcohol**	$C_6H_5.CH_2OH$	108.06	1.0500^{15}_{15}
4	“ (K.)	$C_6H_5.CH_2OH$	108.06	1.047^{25}_{25}
5	**Benzaldehyde**	$C_6H_5.CHO$	106.05	1.0504^{15}_{4}
6	**Benzaldoxime** (α) (anti)	$C_6H_5.CH: NOH$	121.10	1.11^{20}
7	“ (β) (syn.)	$C_6H_5.CH: NOH$	121.10	1
8	**Benzamide**	$C_6H_5.CONH_2$	121.10	1.341^{4}
9	**Benzanilid**	$C_6H_5.CONHC_6H_5$	197.13	$1.306–1.321^{4}$
10	**Benzene**	C_6H_6	78.05	0.8799^{20}_{4}
11	“ (K.)	C_6H_6	78.05	0.876^{25}_{25}
12	hexabromide (trans.)	$C_6H_6Br_6$	457.81	....
13	hexachloride	$C_6H_6Cl_6$	290.75	1.87^{20}
14	sulphinic acid	$C_6H_5.SO_2H$	142.11	....
15	sulphone amide	$C_6H_5.SO_2NH_2$	157.16	....
16	sulphone chloride	$C_6H_5SO_2Cl$	176.55	1.3842^{15}_{15}
17	sulphonic acid	$C_6H_5.SO_3H + H_2O$	176.13	....
18	**Benzamidine**	$C_6H_5C(: NH).NH_2$	120.10	....
19	**Benzidine** (p.)	$NH_2.C_6H_4.C_6H_4.NH_2$	184.14	....
20	**Benzil**	$C_6H_5CO.COC_6H_5$	210.08	....
21	**Benzilic** acid	$(C_6H_5)_2.C(OH).CO_2H$	228.10	....
22	**Benzoic** acid	$C_6H_5.CO_2H$	122.05	1.2659^{15}_{4}
23	anhydride	$(C_6H_5.CO)_2O$	226.08	1.1989^{15}_{4}
24	**Benzophenone**	$(C_6H_5)_2CO$	182.08	1.0976^{50}_{50}
25	“ alotropic	$(C_6H_5)_2CO$	182.08	....
26	**Benzotrichloride**	$C_6H_5C.Cl_3$	195.39	1.380^{14}
27	**Benzoyl**-acetic acid	$C_6H_5.COCH_2CO_2H$	164.06	....
28	acetone (K.)	$C_6H_5.CO.CH_2.CO.CH_3$	162.08	....
29	benzoic acid (o.)	$C_6H_5.COC_6H_4.CO_2H + H_2O$	244.10	....
30	“ “ (m.)	$C_6H_5: COC_6H_4.CO_2H$	226.08	....
31	“ “ (p.)	$C_6H_5: COC_6H_4.CO_2H$	226.08	....
32	bromide	C_6H_5COBr	185.00	1.570^{15}
33	chloride	$C_6H_5.COCl$	140.49	1.2188^{15}_{4}
34	“ (K.)	$C_6H_5.COCl$	140.49	1.211^{25}_{25}
35	cyanide	$C_6H_5.COCN$	131.08	....
36	fluoride	C_6H_5COF	124.04	>1
37	iodide	$C_6H_5.COI$	231.01	....
38	peroxide (K.)	$(C_6H_5CO)_2O_2$	242.08	....
39	**Benzyl** acetate	$CH_3.CO_2.CH_2.C_6H_5$	150.08	1.062^{15}
40	aceto-acetic ether (K.)	$C_2H_3O.CH(C_7H_7)CO_2C_2H_5$	220.13	1.061^{25}_{25}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	....	....	−16.1° C.	212.4°....	....
2	insol. dec.	∞	∞	....	202 − 6°...	wh. → yel...
3	4.0^{17}	∞	∞	....	206.5° C.	....
4	4.0^{17}	soluble	∞	....	202–5°	....
5	0.3	∞	∞	−13.5°	179.9°	....
6	v. soluble	v. soluble	v. soluble	35°	200°; $134°^{20}$	leaflets......
7	sol. bz.	....	v. soluble	128–30°	....	rhombic tab. or need./et.
8	1.35^{25}	26.9^{25}	v. soluble	128°	290°	moncl. tricl.
9	insoluble	soluble	s. soluble	160–1°	dist.	leaflets
10	0.072^{22}	∞	∞	5.42°	80.20°	rhombic pris.
11	0.01 abt.	soluble	∞	5.4°	80–1°	rhombic pris.
12	....	s. soluble	s. soluble	212°	....	monoclinic...
13	4.35^{15} chlo.	6.5^{18} bz.	v. sol. anil.	157°	dec. 288°	monoclinic...
14	s. soluble	v. soluble	v. soluble	83–4°	dec. 100°	long prisms..
15	0.43	v. soluble	v. soluble	150°	....	need. or leaf..
16	insoluble	v. soluble	soluble	14.5°	251.5° C.	....
17	v. v. sol.	v. v. sol.	insoluble	65–6°	$135–7°^{0}$	large leaflets.
18	mod. sol.	v. soluble	s. soluble	75–80°	....	crystalline
19	0.04^{12}	soluble	2.2	127.5–8°	$400–1°^{740}$	leaflets/w....
20	insoluble	v. soluble	v. soluble *	95°	346–8° C. †	hexag. pris./e
21	s. soluble	v. soluble	v. soluble	150°	dec. 180°	moncl. need..
22	0.3400^{25}	48^{20}	31^{20}	121.25° C.	249.2° C.	moncl. nd., lf.
23	insoluble	mod. sol.	mod. sol.	42°	360°	rhombic pris.
24	insoluble	13.5^{18}	17.5^{13}	48–8.5°	305.44° C.	lg. rhom. pris.
25	....	v. soluble	v. soluble	26–6.5°	306°	large moncl..
26	dec.	....	....	−21.2°	213–4°	....
27	s. soluble	v. soluble	v. soluble	103–4° dec.	....	mic. needles.
28	insoluble	v. soluble	soluble	59–60°	....	pris.→yel.
29	mod. sol.	....	....	93°, 27°anh	....	tricl. need./w.
30	v. s. sol.	v. soluble	v. soluble	161–2°	....	large needles.
31	v. s.sol.hot	v. soluble	v. soluble	194°	sub.	moncl.leaf/w
32	....	soluble	....	0°	218–9°	....
33	dec.	dec.	∞	−1°	197.2° C.	....
34	v. s. sol.	sol. dec.	∞	−1 −0°	196–8°	....
35	insoluble	....	....	32–3°	206–8°	tablets......
36	....	....	....	....	$161.5°^{745}$	....
37	dec.	soluble	....	dec.	dec.	leaflets......
38	insoluble	soluble	soluble	103–4°	....	wh. prisms
39	....	....	....	....	206°	....
40	insoluble	∞	∞	....	284–90° d.	wh.→yel.

* Soluble in KOH. † Decomposes.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Benzyl** amine	$C_6H_5.CH_2NH_2$	107.11	0.9865^{15}_{15}
2	benzoate	$C_6H_5.CO_2.CH_2.C_6H_5$	212.10	1.114^{18}
3	bromide	$C_6H_5.CH_2Br$	171.02	1.4380^{22}_{0}
4	carbinol	$C_6H_5.CH_2.CH_2OH$	122.08	1.0235^{15}
5	chloride	$C_6H_5.CH_2Cl$	126.51	1.1040^{15}_{15}
6	cyanide	$C_6H_5.CH_2CN$	117.10	1.0214^{15}_{15}
7	disulphide	$(C_6H_5.CH_2)_2S_2$	246.24	....
8	ether	$(C_6H_5.CH_2)_2O$	198.12	1.0359^{16}
9	**Benzylidene** acetone (K.)	$C_6H_5.CH: CH.CO.CH_3$	146.08	....
10	**Benzyl** iodide	$C_6H_5.CH_2I$	218.02	1.7335^{25}
11	ketone	$(C_6H_5.CH_2)_2CO$	210.11	....
12	" (K.)	$(C_6H_5.CH_2)_2CO$	210.11	....
13	mercaptan	$C_6H_5.CH_2.SH$	124.13	1.058^{20}
14	mustard oil	$C_6H_5.CH_2.NCS$	149.16	1.+
15	sulphide	$(C_6H_5.CH_2)_2S$	214.18	1.0712^{50}_{50}
16	sulphocyanide	$C_6H_5.CH_2SCN$	149.16	....
17	sulphone	$(C_6H_5.CH_2)_2SO_2$	246.18	....
18	urea	$C_6H_5.CH_2.NH.CO.NH_2$	150.16	....
19	**Berberonic** acid	$2:4:5C_5H_5N(CO_2H)_3 2H_2O$	247.11	....
20	**Beryllium** ethyl	$Be(C_2H_5)_2$	67.18	....
21	**Bi-anthryl**	$C_{28}H_{18}$	354.15	....
22	**Bilirubin**	$C_{34}H_{36}N_4O_7$	608.41	....
23	**Bismuth** tri-ethyl	$Bi(C_2H_5)_3$	295.62	1.82
24	**Biuret**	$NH(CONH_2)_2.H_2O$	121.18	....
25	**Borneol** (i.)	$C_{10}H_{17}OH$	154.15	1.011
26	" (d.)	$C_{10}H_{17}OH$	154.15	1.011
27	**Bornyl** amine (d.)	$C_{10}H_{17}NH_2$	153.20	....
28	**Brassidic** acid	$C_{22}H_{42}O_2$	338.34	0.8585^{57}_{4}
29	**Bromacetic** acid	CH_2BrCO_2H	138.99	....
30	**Bromacetylene**	$HBrC: C:$	104.97	....
31	**Bromal**	$CBr_3.COH$	280.89	3.34
32	**Bromaniline** (o.)	$BrC_6H_4NH_2$	172.05	....
33	" (m.)	$BrC_6H_4NH_2$	172.05	1.5820^{21}
34	" (p.)	$BrC_6H_4NH_2$	172.05	....
35	**Brombenzamide** (o.)	$BrC_6H_4CONH_2$	200.05	....
36	" (m.)	$BrC_6H_4CONH_2$	200.05	....
37	" (p.)	$BrC_6H_4CONH_2$	200.05	....
38	**Brombenzene**	C_6H_5Br	157.00	1.4991^{15}_{15}
39	**Brombenzoic** acid (o.)	$BrC_6H_4.CO_2H$	201.00	....
40	" " (m.)	$BrC_6H_4.CO_2H$	201.00	....

* Soluble CS_2 and benzene; 0.1003^{23} parts soluble in 100 parts chloroform.

† Very soluble in acetone and ligroin.

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	∞	∞	∞	....	184.5° C.	....
2	....	soluble	....	<20°	323–4° C.	leaflets......
3	....	....	....	−3.9°	198–9°	....
4	s. soluble	soluble	v. soluble	....	219° C.	....
5	insoluble	∞	∞	−43.2° C.	179°	....
6	insoluble	∞	∞	−24.6° C.	233.5° C.	....
7	sol. benzene	s. soluble	v. soluble	71°–72°	....	leaflets/al....
8	....	v. sol. hot	soluble	....	295–8°	oily.........
9	insoluble	v. soluble	v. soluble	41–2°	....	tab. → yel...
10	s. sol. CS_2	....	....	34.1°	decomp.	crystalline...
11	....	....	soluble	33.9°	330.6° C.	large cryst/et
12	insoluble	v. soluble	v. soluble	33–4°	326–30°	wh. → yel...
13	....	....	....	....	194–5°	....
14	insoluble	....	soluble	....	243°	....
15	insoluble	soluble	soluble	49°	....	rhomb. tab./e
16	insoluble	v. soluble	v. soluble	41°	230–5°	prisms .....
17	v. sol. acet.	s. soluble	v. sol. bz.	150°	....	flat needles/w
18	v. s. sol.	v. soluble	v. s. sol.	147–8°	....	sm. needles..
19	v. s. sol.	v. s. sol.	insoluble	235°	....	triclinic pris.
20	....	....	....	....	185–8°	....
21	....	....	....	300°	....	leaf. toluene .
22	insoluble	v. s. sol.	v. v. s. sol.*	192–2.8°..	....	monocl./chlo.
23	insoluble	v. soluble	v. soluble †	....	107°	oily
24	1.54^{15}	soluble	....	190° dec.	....	needles......
25	v. s. sol.	v. soluble	v. soluble	210.5°	sublimes	hexag.leaf./li.
26	v. s. sol.	v. soluble	v. soluble ‡	206°	211–12°	hexag. leaf...
27	v. v. s. sol.	v. v. sol.	v. v. sol.	163°	$203–4°^{735}$	....
28	$0.74/^{24}$	v. s. sol.	soluble §	114°	$282°^{30}$	leaflets/alc...
29	deliq. ∞	∞	∞	49–50°	208°; $117°^{15}$	hexagonal...
30	v. soluble	mod. sol.	....	....	−2° abt.	liquid at 3 at.
31	decomp.	....	....	....	174.0°	....
32	....	soluble	....	31–31.5°	250–1°	crystalline...
33	....	soluble	....	18–18.5°	251°; $130°^{12}$	crystalline...
34	insoluble	v. soluble	v. soluble	66.4°	dec.	rhombic.....
35	sol. hot	soluble	s. soluble	155.6° C.	....	needles/w....
36	s. sol. hot	v. soluble	....	155.3° C.	....	leaflets/dil.al.
37	v. s. sol. hot	mod. sol.	s. soluble	189.5° C.	....	rectang. tab..
38	....	soluble	v. soluble	−30.5° C.	156.6°	....
39	0.185^{25}	v. soluble	v. soluble	150°	subl.	large need./w.
40	0.04^{25}	v. soluble	v. soluble	155°	>280°	needles......

‡ 16 parts dissolve in 100 parts lig. at 20°, and 24 parts in 100 parts benz.
§ Insoluble ligroene and benzene.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Brombenzoic acid** (p.)	$BrC_6H_4.CO_2H$	201.00	....
2	**Bromethylene**	CH_2: CHBr	106.99	1.5167^{14}_{4}
3	**Bromine cyanide**	BrCN	106.00	....
4	**Brommalonic acid**	$CHBr(CO_2H)_2$	182.99	....
5	**Bromnaphthaline** (α)	$C_{10}H_7Br$	207.02	1.4922^{19}
6	" (β)	$C_{10}H_7Br$	207.02	1.605^{0}
7	**Bromnitrobenzene** (o.)	$BrC_6H_4NO_2$	202.04	....
8	" (m.)	$BrC_6H_4NO_2$	202.04	....
9	" (p.)	$BrC_6H_4NO_2$	202.04	1.934^{22}
10	**Bromoform**	$CHBr_3$	252.89	2.8842^{25}
11	Phg. IV (K.)	$CHBr_3$	252.89	2.829–2.832
12	**Bromphenol** (o.)	BrC_6H_4OH	173.00	....
13	" (m.)	BrC_6H_4OH	173.00	....
14	" (p.)	BrC_6H_4OH	173.00	1.840^{15}
15	**Brompyridine** (3)	$C_5H_4N.Br$	158.03	1.632^{10}
16	**Bromtoluene** (o.)	$BrC_6H_4CH_3$	171.02	1.4309^{15}_{15}
17	" (m.)	$BrC_6H_4CH_3$	171.02	1.4099^{20}_{4}
18	" (p.)	$BrC_6H_4CH_3$	171.02	1.3540^{64}_{4}
19	**Butane**	$CH_3.CH_2.CH_2.CH_3$	58.08	0.60^{0} 2.046(a)
20	**Butyl acetate**	$CH_3.CO_2.C_4H_9$	116.10	0.8817^{20}
21	acetylene	$C_4H_9.C \vdots CH$	82.08	....
22	alcohol (n.)	$CH_3.(CH_2)_2.CH_2OH$	74.08	0.8138^{15}_{15}
23	" (K.)	$CH_3.(CH_2)_2.CH_2OH$	74.08	$0.807–0.808^{25}_{25}$
24	" sec.	$CH_3.CHOH.CH_2CH_3$	74.08	0.819^{22}
25	amine (n.)	$CH_3(CH_2)_2CH_2NH_2$	73.13	0.7401^{20}
26	benzene	$C_6H_5(CH_2)_3.CH_3$	134.12	0.8620^{20}_{0}
27	benzoate	$C_6H_5CO_2.C_4H_9$	178.12	1.0111^{15}_{15}
28	bromide	$CH_3.(CH_2)_2CH_2Br$	137.03	1.2792^{20}
29	butyrate (n.)	$C_3H_7.CO_2.C_4H_9$	144.13	0.8878^{0}
30	carbinol (tert.)	$(CH_3)_3C.CH_2OH$	88.10	0.8122^{20}
32	chloride	$CH_3(CH_2)_3Cl$	92.52	0.8874^{20}
33	" (tert.) (K.)	$(CH_3)_3CCl$	92.52	0.840^{25}_{25}
31	cyanide	$CH_3.(CH_2)_3CN$	83.04	0.9995^{24}
34	ether	$(C_4H_9)_2.O$	130.15	0.769^{20}
35	" (sec.)	$(CH_3(C_2H_5)CH)_2O$	130.15	0.7616^{15}
36	formate	$HCO_2C_4H_9$	102.08	0.9108
37	iodide	$CH_3.(CH_2)_2CH_2I$	184.04	1.6166^{20}_{4}
38	mercaptan	$CH_3.(CH_2)_2CH_2SH$	90.14	0.858^{0}
39	mustard oil	$CH_3.(CH_2)_3.NCS$	115.17	....
40	phenyl ketone	$C_4H_9.CO.C_6H_5$	162.11	....
41	sulphide	$(C_4H_9)_2S$	146.21	0.8523^{0}

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	0.0037^{25}	v. soluble	v. soluble	252°	....	mon'cl.nd./w.
2	....	....	....	....	$16°^{750}$	....
3	soluble	soluble	....	52°	$61.3°^{750}$	needles......
4	....	v. soluble	v. soluble	....	....	needles......
5	∞ bz.	∞ abs.	∞	4–5°	$279.5°^{753}$	prisms......
6	sol. bz.	6	v. soluble	59°	281–2° C.	rhombic leaf.
7	....	....	....	38.50°	$264.4°^{760}$	....
8	....	....	....	52.56°	$257.5°^{760}$	....
9	....	soluble	....	124.92°	$259.2°^{760}$	monocl. pris..
10	s. soluble	∞	∞	9°	151.2° C.	....
11	v. s. sol.	soluble	∞	7°	148–50°	....
12	....	....	....	....	194–5°	oil..........
13	....	....	....	32–3°	236–6.5°	leaflets......
14	sol. chlo.	v. soluble	v. soluble	63–4°	238°	tetrag./chlo..
15	v. s. sol.	....	....	....	169.5°	oil..........
16	insoluble	soluble	....	−25.75°	$180.3°^{754}$	....
17	insoluble	soluble	....	−39.8°	183.7°	....
18	insoluble	soluble	soluble	28.5°	185.2°	rhombic.....
19	insoluble	1800 cc.	....	....	1°	....
20	s. soluble	∞	∞	....	$125.1°^{740}$	....
21	....	....	....	....	70.5–2.0°	....
22	8.3	∞	∞	....	117.02° C.	....
23	s. soluble	∞	∞	....	115–7°	....
24	29^{20}	....	....	....	99.8°	....
25	∞	soluble	soluble	....	77.8°	....
26	....	....	....	....	183–5°	....
27	....	....	....	< −20°	249° C.	thick oil....
28	....	....	....	....	105°	....
29	....	....	....	....	164.8° C.	....
30	s. soluble	....	....	52–3°	113–4°	....
31	....	....	....	....	77.96° C.	....
32	v. s. sol.	∞	∞	....	49–52°	colorless
33	insoluble	....	....	....	$160°^{764}$	....
34	soluble	....	....	....	140.9°	....
35	....	∞	∞	....	122–2.5°	....
36	....	....	....	....	106.9°	....
37	....	....	....	....	129.9°	....
38	....	....	....	....	97–8°	....
39	....	....	....	....	167°	....
40	....	....	....	....	237.5–8.5°	....
41	insoluble	....	....	....	182°	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Butylene**	$C_2H_5.CH:CH_2$	56.06	
2	**Butyramide** (n.) (K.)	$CH_3.CH_2.CH_2.CONH_2$	87.11	
3	**Butyric acid** (n.)	$CH_3.(CH_2)_2CO_2H$	88.06	0.9599^{19}_{4}
4	" " (K.)	$CH_3.(CH_2)_2CO_2H$	88.06	0.956^{25}_{25}
5	aldehyde	$CH_3.(CH_2)_2CHO$	72.06	0.8170^{20}_{4}
6	anhydride	$(CH_3.(CH_2)_2CO)_2O$	158.12	0.978^{15}
7	**Cacodyl**	$(CH_3)_2As.As.(CH_3)_2$	210.10	1.+
8	chloride	$(CH_3)_2AsCl$	140.50	1.+
9	**Cacodylic acid**	$(CH_3)_2AsO.OH$	138.05	
10	**Cacodyl oxide**	$((CH_3)_2As)_2O$	226.10	1.462^{15}
11	sulphide	$((CH_3)_2.As)_2S$	242.16	
12	trichloride	$(CH_3)_2AsCl_3$	211.40	
13	**Cadmium methyl**	$Cd(CH_3)_2$	142.45	
14	**Caffeic acid**	$C_9H_8O_4+\frac{1}{2}H_2O$	189.07	
15	**Caffeine**	$C_8H_{10}N_4O_2+H_2O$	212.26	1.23^{19}
16	**Camphene** (i.)	$C_{10}H_{16}$	136.12	
17	" (d. or l.)	$C_{10}H_{16}$	136.12	
18	**Campholene**	$(CH_3)_3C_6H_7$	124.13	0.8034^{20}
19	**Campholic acid**	$C_9H_{15}.CO_2H$	170.15	
20	**Camphor** (d.)	$C_{10}H_{16}O$	152.13	0.992^{10}
21	**Camphoric acid** (i.)	$C_8H_{14}(CO_2H)_2$	200.13	1.228
22	" " (d.)	$C_8H_{14}(CO_2H)_2$	200.13	1.186
23	" anhydride	$C_{10}H_{14}O_3$	182.12	1.194^{20}
24	**Camphoronic acid** (l.)	$C_6H_{11}(CO_2H)_3$	218.12	
25	**Cantharidine**	$C_{10}H_{12}O_4$	196.10	
26	**Caoutchene**	C_4H_6	54.05	0.65^{-20}
27	**Capric acid**	$CH_3.(CH_2)_8CO_2H$	172.16	0.8858^{40}_{4}
28	" " (K.)	$CH_3.(CH_2)_8CO_2H$	172.16	0.930^{37}_{15}
29	**Caproic acid**	$CH_3.(CH_2)_4CO_2H$	116.10	0.9289^{20}
30	**Caprylic acid**	$CH_3.(CH_2)_6CO_2H$	144.13	0.9100^{20}_{4}
31	" anhydride	$(C_8H_{15}O)_2O$	270.24	
32	**Carbanil**	C_6H_5NCO	119.08	1.092^{15}
33	**Carbanilid**	$CO(NHC_6H_5)_2$	212.18	
34	**Carbazol**	$(C_6H_4)_2NH$	167.11	
35	**Carbazoline**	$C_{12}H_{15}N$	173.16	
36	**Carbon diselenide**	CSe_2	170.40	
37	disulphide	CS_2	76.12	1.2555^{22}
38	hexachloride	C_2Cl_6	236.70	1.9988^{29}_{4}
39	monoxide	CO	28.00	0.9674

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	....	....	....	....	1.5–2.5°	....
2	soluble	soluble	s. soluble	115–6°	....	wh. tablets . .
3	∞	∞	∞	−7.9° C.	162.3° C.	....
4	∞	∞	∞	abt. −4°	161–3°	....
5	3.6	....	....	....	73–4°	....
6	....	....	....	....	191–3°	....
7	s. soluble	soluble	soluble	−6°	170°	oil..........
8	insoluble	....	....	....	100°	....
9	v. soluble	soluble	v. s. sol.	200°	....	rhomb. pris. .
10	insoluble	....	....	−25°	120°	....
11	soluble	soluble	....	....	....	....
12	....	....	....	dec. 40–50°	....	....
13	dec.	....	....	....	104–5°?	....
14	soluble	v. soluble	....	195°	dec.	yel. moncl. pris./w.
15	1.35^{16} *	0.93^{21} 95% 3.12^{78}abs.	0.044^{16} 0.30^{35}	234–5°	sub. 116°^{0}	glit. needles. .
16	insoluble	v. soluble	v. soluble	49.5–5.0°	157° C.	feath. need...
17	insoluble	v. soluble	v. soluble	51–2°	159° C.	feath.cryst.
18	insoluble	v. soluble	v. soluble	....	138°	....
19	0.016^{19}	soluble	soluble	105–6°	255°	leaf./et.+al.
20	v. s. sol.	120^{12}	v. soluble	176.4°	209.1° C.	hexagonal
21	0.239	33	28	208°	....	crystals
22	0.625^{12}	112	insoluble	200–2°	dist. in CO_2	monoclinic . .
23	v. s. sol.	v. soluble	v. soluble	220–1°	dec. 270°	rhb. pris./al..
24	6.0	v. soluble	v. soluble	136–7°	dist.	sm. needles . .
25	0.003	100	0.11	218° C.	....	trimet. tab. . .
26	....	....	....	−10°	14.5°	....
27	v. s. sol.	soluble	soluble	31.3°	268.4° C.	needles . .
28	v. s. sol. hot	soluble	soluble	30–1°	268–9°	finewhite nee.
29	s. soluble	soluble	soluble	−5.2°	205°	oily liquid . . .
30	0.25^{100}	∞	∞	16.5°	237.5° C.	leaflets......
31	....	....	....	....	280–90°	oil..........
32	dec.	comb.	....	....	166°^{769}	....
33	v. s. sol.	v. soluble	v. soluble	240.10° C.	sub. 260°	prisms/al....
34	insoluble	0.92	s. soluble	238°	351.5° C.	leaf. tablets. .
35	v. s. sol.	v. soluble	v. soluble	99°	296–7°	silky need. or
36	....	....	....	....	....	yellow. . [pris.
37	0.218^{22}	∞	∞	−108.6° C.	46.2°	....
38	insoluble	mod. sol.	v. soluble	187°	185°	rhb. tab./al.
39	3.3 cc.	20 cc.^{20}	....	−211°	−190°	....

* 0.059 CS_2; 12.97 chlo.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Carbon** oxysulphide	COS	60.06	2.1040
2	suboxide	OC: C: CO	68.00	...
3	tetrabromide	CBr_4	331.84	3.42
4	tetrachloride	CCl_4	153.80	$1.6084\frac{9.5}{4}$
5	" (K.)	CCl_4	153.80	$1.591\frac{25}{25}$
6	tetraiodide	CI_4	519.88	4.32^{20}
7	**Carbonyl** chloride	$COCl_2$	98.90	$1.392\frac{19}{4}$
8	**Carbostyril**	Py2, C_9H_6NOH	145.10	...
9	**Carboxy-cinnamic ac.** (o.)	$CO_2H.C_6H_4.CH{:}CH.CO_2H$	192.06	...
10	**Carminic** acid	$C_{22}H_{22}O_{13}$	494.18	...
11	**Carvacrol**	$(CH_3)_2CH.C_6H_3(CH_3).OH$	150.12	$0.9777\frac{20}{20}$
12	**Cellulose**	$(C_6H_{10}O_5)x, x=34?$	162.08	1.27–1.61
13	**Cerotic** acid	$C_{26}H_{52}O_2$	396.42	$0.8359\frac{79}{4}$
14	**Ceryl** alcohol	$C_{26}H_{54}O$	382.43	...
15	**Cetyl** "	$C_{16}H_{33}OH$	242.27	$0.8176\frac{50}{4}$
16	**Chlor-acetic** acid	$ClCH_2.CO_2H$	94.48	1.3978^{64}
17	" " (K.)	$ClCH_2.CO_2H$	94.48	1.3978^{64}
18	-acetone	$CH_2Cl.CO.CH_3$	92.49	1.162^{16}
19	-acetyl chloride	$CH_2Cl.COCl$	112.92	1.495°
20	-acetylene	HClC : C :	60.46	...
21	-allylene	CH ⋮ $C.CH_2Cl$	74.48	1.0454^{5}
22	-aniline (o.)	$ClC_6H_4.NH_2$	127.54	$1.2125\frac{20}{4}$
23	" (m.)	$ClC_6H_4.NH_2$	127.54	$1.2156\frac{20}{4}$
24	" (p.)	$ClC_6H_4.NH_2$	127.54	1.340^{18}
25	benzamide (o.)	$ClC_6H_4CONH_2$	155.54	...
26	" (m.)	$ClC_6H_4CONH_2$	155.54	...
27	" (p.)	$ClC_6H_4CONH_2$	155.54	...
28	benzene	C_6H_5Cl	112.49	$1.1125\frac{15}{15}$
29	" (K.)	C_6H_5Cl	112.49	$1.104\frac{25}{25}$
30	benzoic acid (o.)	$ClC_6H_4.CO_2H$	156.49	1.540
31	" " (m.)	$ClC_6H_4.CO_2H$	156.49	...
32	" " (p.)	$ClC_6H_4.CO_2H$	156.49	1.541^{24}
33	diphenyl (o.)	$Cl.C_6H_4.C_6H_5$	188.52	...
34	" (m.)	$Cl.C_6H_4.C_6H_5$	188.52	...
35	" (p.)	$Cl.C_6H_4.C_6H_5$	188.52	...
36	ether	$CH_3.CHCl.O.C_2H_5$	108.52	...
37	ethyl alcohol (2)	$CH_2Cl.CH_2OH$	80.49	1.2005^{19}
38	**Chlorhydrine**	$CH_2Cl.CHOH.CH_2OH$	110.50	1.1302^{0}
39	**Chlor-methyl** ether	$ClCH_2.O.CH_3$	80.49	1.0625^{10}
40	malonic acid	$CHCl.(CO_2H)_2$	138.48	...
41	naphthaline (α)	$C_{10}H_7Cl$	162.51	$1.1938\frac{20}{4}$

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	100 cc.	∞	∞	....	0°12.5 at.	....
2	sol. dec.	....	soluble	−107° abt.	7°	long cryst...
3	insoluble	soluble	soluble	92.5°	189.5°	tablets. ....
4	0.080^{20}	∞	∞	−19.5°	76.74° C.	....
5	v. v. s. sol.	∞	∞	....	76–7°	....
6	....	....	....	....	dec.	red regular ..
7	dec.	dec.	....	< −75°	8.2° C.	....
8	v. s. sol.	v. soluble	v. soluble	199–200°	sub.	large pris./al.
9	s. soluble	v. soluble	s. soluble	173–5°	....	needles/w....
10	v. soluble	s. soluble	v. s. sol.	dec. 136°	....	monocl.prism.
11	sol. KOH	....	soluble	0°	237.97° C.	thick oil.....
12	insoluble	insoluble	insol.	....	....	amorphous ..
13	insoluble...	v. soluble	20^{35} *	82.5°	dec.	mic. need./al.
14	....	soluble	....	79°	....	crystals.....
15	insoluble	soluble	soluble	50°	344°, $119^{\circ 0}$	leaflets/al....
16	v. soluble	soluble	soluble	62.5–3.2°	185–7°	rhomb. tab..
17	v. soluble	v. soluble	v. soluble	62–3°	185–7°	rhomb. tab. [or pris.
18	s. soluble	∞	∞	....	119°	
19	decomp.	....	....	....	105–6°	....
20	spon. comb.	....	....	....	....	....
21	....	....	....	....	65°	....
22	....	....	soluble	< −14°	207°	....
23	....	....	....	....	$230^{\circ 767}$	....
24	....	....	soluble	69.7°	232.3° C.	rhomb.prisms
25	s. soluble	v. soluble	v. soluble	142.4° C.	....	long need./w
26	s. soluble	v. soluble	....	134.5°	....	needles......
27	v. s. sol.	v. soluble	v. soluble	178.3° C.	....	needles/et. ..
28	....	soluble	....	−44.9°	132°	....
29	....	....	∞	−45°	131–2°	....
30	0.11^{0}	v. soluble	v. soluble	142°	....	rhomb. tab.
31	0.04^{0}	soluble	soluble	158°	sub.	small prisms.
32	0.02	v. soluble	v. soluble	243°	....	monocl. tab..
33	....	sol. lig.	v. soluble	34°	267–8°	moncl. prisms
34	....	....	....	89°	....	....
35	....	....	....	75.5°	282°	thin leaflets..
36	dec.	dec.	∞	....	97–8°	....
37	∞	∞	∞	....	132°, $51^{\circ 22}$	....
38	soluble	soluble	soluble	....	127°	....
39	dec.	....	....	....	59.5°	....
40	v. soluble	v. soluble	v. soluble	133°	....	prisms......
41	....	soluble	....	....	263°	....

* v. sol. acetone, bz., chlo., and CS_2.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Chlor-naphthaline** (β)	$C_{10}H_7Cl$	162.51	1.2656^{16}
2	nitro-benzene (o.)	$ClC_6H_4NO_2$	157.52	1.368^{22}
3	" (m.)	$ClC_6H_4NO_2$	157.52	1.534
4	" (p.)	$ClC_6H_4NO_2$	157.52	1.520^{18}
5	**Chloral**	$CCl_3.CHO$	147.36	1.5121^{20}_{4}
6	hydrate	$CCl_3.CH(OH)_2$	165.38	1.901
7	**Chloroform**	$CHCl_3$	119.36	1.4760^{22}
8	**Chlorophyll**	$C_{38}H_{42}O_7N_4Mg$	690.90	....
9	**Chlor-phenol** (o.)	ClC_6H_4OH	128.49	....
10	" (m.)	ClC_6H_4OH	128.49	....
11	" (p.)	ClC_6H_4OH	128.49	1.306^{20}
12	propionic ac. (α)	$CH_3.CHCl.CO_2H$	108.49	1.28^{0}
13	" " (β)	$CH_2Cl.CH_2.CO_2H$	108.49	....
14	pyridine (2)	C_5H_4ClN	113.52	1.205^{15}
15	" (4)	C_5H_4ClN	113.52	....
16	quinoline (py. 2)	C_9H_6ClN	163.54	1.2754^{17}
17	" (py. 4)	C_9H_6ClN	163.54	1.3766^{17}
18	toluene (o.)	$ClC_6H_4.CH_3$	126.51	1.0877^{15}_{15}
19	" " (K.)	$ClC_6H_4.CH_3$	126.51	1.082^{20}_{15}
20	" (m.)	$ClC_6H_4.CH_3$	126.51	1.0722^{20}_{4}
21	" " (K.)	$ClC_6H_4.CH_3$	126.51	1.074^{20}_{15}
22	" (p.)	$ClC_6H_4CH_3$	126.51	1.0749^{15}_{15}
23	" " (K.)	$ClC_6H_4CH_3$	126.51	1.071^{20}_{15}
24	trinitro-benzene	$ClC_6H_2(NO_2)_3 2:4:6$	247.48	1.797^{20}
25	**Cholesterin**	$C_{26}H_{43}OH + H_2O$	390.37	1.067
26	**Cholic acid**	$C_{24}H_{40}O_5 + H_2O$ or C_2H_6O	426.34	....
27	**Chrysaniline**	$C_{19}H_{15}N_3 + 2H_2O$	321.28	....
28	**Chrysene**	$C_{18}H_{12}$	228.10	....
29	**Chrysine**	$C_{15}H_{10}O_4$	254.08	....
30	**Cincholic acid**	$C_7H_8O_6$	188.06	....
31	**Cinchomeronic acid**	$3,4C_5H_3N(CO_2H)_2$	167.08	....
32	**Cinnamic acid**	$C_6H_5.CH:CH.CO_2H$	148.06	1.2475^{4}
33	**Cinnamic aldehyde**	$C_6H_5.CH:CH.CHO$	132.06	1.1129^{15}_{15}
34	" " (K.)	$C_6H_5.CH:CH.CHO$	132.06	1.048^{25}_{25}
35	" anhydride	$(C_9H_7O)_2O$	278.12	....
36	**Cinnamyl alcohol**	$C_6H_5.CH:CH.CH_2OH$	134.08	1.0397^{35}_{35}
37	chloride	C_9H_7OCl	166.51	....
38	**Citraconic acid**	$CH_3.C.(CO_2H):HC.CO_2H$	130.05	1.617
39	anhydride	$C_5H_4O_3$	112.03	1.250^{15}
40	**Citral**	$C_9H_{15}.CHO$	152.13	0.8868^{20}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	soluble	soluble	56°	$264–6°\text{ C.}^{751}$	rhomb. leaf..
2	....	soluble	soluble	32.5°	$245.5^{\circ 753}$	needles .....
3	v. sol. bz.	v. sol. hot	soluble	44.4°	235.6° C.	rhombic.....
4	....	soluble	....	83°	242°	monocl. pris.
5	v. soluble	∞	∞	−57.5°	97.7° C.	....
6	66	v. soluble	sol. CS_2	57°	97.5°	moncl. tab...
7	0.63^{22}	∞	∞	−63.2° C.	$62^{\circ 760}$	....
8	insoluble	v. soluble	v. s. sol.	no mp.	dec.	hexagonal
9	....	soluble	....	7°	175–6°	....
10	....	soluble	....	28.5°	214°	crystals.....
11	v. s. sol.	v. soluble	v. soluble	37°	217°	crystals.....
12	∞	∞	∞	....	186°	....
13	v. soluble	v. soluble	∞	41.5°	203–5°	leaflets......
14	v. s. sol.	....	....	....	$166^{\circ 714}$	....
15	mod. sol.	....	....	....	147–8°	....
16	v. v. s. sol.	v. v. sol.	v. v. sol.	37–8°	$275^{\circ 751}$	need./dil. al..
17	sol. HCl	v. v. sol.	v. v. sol.	34°	$260–1^{\circ 744}$	....
18	insoluble	....	....	−34.0°	155°	....
19	s. soluble	soluble	∞	−34°	158–9.5°	....
20	....	....	....	−47.8°	$162^{\circ 756}$	....
21	s. soluble	soluble	∞	−47°	160.5–2.5°	....
22	insoluble	....	....	7.4°	$162.3^{\circ 756}$	....
23	s. soluble	soluble	∞	6.5–7.5°	160.5–2.5°	moncl.tab./e.
24	insoluble	v. sol. hot	s. soluble	83°	....	moncl.pr./chl
25	insoluble	11^{78} 1.08^{17}	18	148.5° C.	360° in vac.	monocl. tab..
26	0.025	$4.8^{70}\%$	0.2^{18}	195°	dec. 160°	tetrahed./al..
27	v. v. s. sol.	s. soluble	....	267–70°	dist.	yel. need......
28	s. soluble	0.097^{16}	v. s. sol.	250°	$448^{\circ 760}$	scales or rhb.
29	v. v. s. sol.	2.0^{78} *	....	275°	subl. need	yellowtab./al.
30	v. sol. hot	soluble	s. soluble	168–9°	....	moncl.tab./w.
31	v. s. sol.	s. soluble	v. v. s. sol.	258–9°	dec......	prisms HCl..
32	0.049^{25}	13.9^{20} abs.	v. soluble	133°	300°	moncl. prisms
33	v. s. sol.	∞	∞	−7.5°	$209.5^{\circ 250}\text{ C.}$	....
34	....	soluble	∞	−8°	248–50° dec.	colorless to brownish
35	insoluble	v. s. sol.	sol. bz.	130–5°	....	prisms/al....
36	mod. sol.	v. soluble	v. soluble	33°	257.5° C.	long needles .
37	....	....	soluble	35–6°	$170^{\circ 58}$	crystals.....
38	245^{15}	s. sol. bz.	soluble	80°	in steam	moncl. prisms
39	insoluble	....	....	7°	213–4° C.	....
40	insoluble	soluble	soluble	....	228–9°	oil..........

* Very slightly soluble benzene, CS_2, chloroform, and ligroene.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Citramalic** acid (rac.)....	$CO_2H.CH_2C(OH)(CH_3)$ CO_2H	148.06	....
2	**Citric** acid.............	$(CO_2H.CH_2)_2C(OH)CO_2H$ $+H_2O$	210.08	1.542
3	**Collidine** (α)...........	$CH_3.C_5H_3N.C_2H_5$........	121.13	0.9268^{16}
4	" (β)...........	$CH_3.C_5H_3N.C_2H_5$........	121.13	0.9656^{0}
5	" (γ)...........	$(CH_3)_3C_5H_2N$..........	121.13	0.917^{15}
6	dicarbonic acid.......	$(CH_3)_3C_5N(CO_2H)_2$......	209.13	....
7	**Coniferine**.............	$C_{16}H_{22}O_8+2H_2O$........	378.21	....
8	**Coniïne** (d.)............	$2,C_5H_{10}N.C_3H_7$..........	127.18	0.8472^{17}
9	**Coumaric** acid (o.)......	$OHC_6H_4CH: CH.CO_2H$	164.06	....
10	" " (p.)......	$OHC_6H_4CH: CH.CO_2H$	164.06	....
11	**Coumarin**.............	$C_9H_6O_2$...............	146.05	....
12	**Coumaron**.............	C_8H_6O................	118.05	1.0776^{15}_{15}
13	**Creatine**..............	$C_4H_9N_3O_2+H_2O$........	149.21	....
14	**Creatinine**............	$C_4H_7N_3O$.............	113.18	....
15	**Creosole**..............	$CH_3.OC_6H_3(CH_3)OH$....	138.08	1.0956^{15}_{15}
16	**Cresole** (o.)...........	$CH_3.C_6H_4OH$..........	108.06	1.0511^{15}_{15}
17	" (m.)...........	$CH_3.C_6H_4OH$..........	108.06	1.039^{15}_{15}
18	" (p.)...........	$CH_3.C_6H_4OH$..........	108.06	1.039^{15}_{15}
19	methyl ether (o.) (K.)	$CH_3.C_6H_4.O.CH_3$........	122.08	0.978^{25}_{25}
20	" " (m.) (K.)	$CH_3.C_6H_4.O.CH_3$........	122.08	0.969^{25}_{25}
21	" " (p.) (K.)	$CH_3.C_6H_4.O.CH_3$........	122.08	0.968^{25}_{25}
22	**Croconic** acid..........	$CO:C:C(CO_2H)_2+3H_2O$	196.07	....
23	**Crotonic** acid (α).......	$CH_3.HC: CH.CO_2H$.....	86.05	0.9730^{72}
24	" " (β) (Iso-)..	$HCH_3C: CH.CO_2H$......	86.05	1.0312^{15}_{4}
25	" aldehyde (α)...	$CH_3HC: CH.CHO$.......	70.05	0.8593^{14}_{4}
26	**Crotonyl** ether..........	$(CH_3CH: CH.CH_2)_2O$....	126.12	0.8895^{0}
27	alcohol.............	$CH_3CH: CH.CH_2OH$.....	72.06	0.8726^{0}
28	**Cumene**...............	$C_6H_5CH(CH_3)_2$..........	120.10	0.8629^{20}_{4}
29	**Cuminalcohol** (p.) (K.)..	$(CH_3)_2CH.C_6H_4.CH_2OH$..	150.11	0.9745^{25}_{25}
30	**Cuminic** acid (p.).......	$(CH_3)_2CH.C_6H_4.CO_2H$....	164.10	1.1625^{4}
31	aldehyde............	$(CH_3)CHC_6H_4CHO$......	148.10	0.9759^{25}_{25}
32	**Cyan-acetic** acid........	$CNCH_2.CO_2H$..........	85.07	....
33	amide..............	$CN.NH_2$..............	42.10	....
34	anilid..............	$CNNHC_6H_5+\frac{1}{2}H_2O$.....	127.14	....
35	aniline.............	$(C_6H_5.NH_2)_2(CN)_2$......	238.28	....
36	**Cyanic** acid...........	$CONH$.............	43.05	1.140^{0}
37	**Cyanoform**............	$HC(CN)_3$.............	91.13	....
38	**Cyanogen**.............	$(CN)_2$...............	52.08	0.866^{17} liq.

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	deliq.	v. soluble	mod. sol.	119°	dec. 200°	monocl. pr...
2	133	75.9	2.26	153°	dec.	rhomb. pris. .
3	less sol. hot	v. soluble	v. soluble	....	179–80°	....
4	insoluble	soluble	....	....	195–6°^{753}	....
5	sol.; insol. hot	....	....	....	171–2°	....
6	v. s. sol.	v. s. sol.	v. s. sol.	no m.p.	....	fine need./w..
7	0.51	soluble	insoluble	185°	dec.	glit. needles .
8	1.1	∞	v. soluble	−2.5°	170°	....
9	s. soluble	v. soluble	v. s. sol.	207–8°	dec.	long. needles.
10	v. s. sol.	v. soluble	v. soluble	206°	....	silky need./w.
11	v. s. sol.	v. soluble	soluble	67°	290–0.5°	rhombic/et. .
12	insoluble	soluble	soluble	< −18°	173–4°	....
13	1.35^{18}	0.008	insoluble	dec.	....	moncl. prisms
14	8.7^{16}	0.98^{16}	....	dec.	....	moncl. prisms
15	s. soluble	∞	∞ ; ∞ bz.	....	221–2°	oil..........
16	0.3	∞	∞	30°	191° C.	crystals......
17	s. soluble	∞	∞	3–4°	202° C.	....
18	s. soluble	∞	∞	36°	202° C.	prisms......
19	insoluble	∞	∞	....	169–71°	colorless.....
20	insoluble	∞	∞	....	173.5–6°	colorless.....
21	insoluble	∞	∞	....	174–6°	colorless.....
22	v. soluble	soluble	....	....	....	yel. needles. .
23	8.3	sol. lig.	....	72°	185° C.	moncl. prisms
24	40	soluble	....	15.45°	171.9° dec.	need. or pr...
25	mod. sol.	....	....	....	104–5°	....
26	....	....	....	....	143.5°	....
27	16.6......	....	....	< −30°	117°	....
28	insoluble	soluble	soluble	....	152.5–3°	....
29	insoluble	∞	∞	....	243–6°	wh.→yel....
30	v. s. sol.	soluble	v. soluble	116.5°	subl.	triclin. pris. or tab./al.
31	....	....	....	....	235.5° C.	....
32	soluble	soluble	soluble	66.1–6.4° C.	dec.	crystals.....
33	v. v. sol.	v. soluble	v. soluble	40° & 203°	....	long needles..
34	s. soluble	v. v. sol.	v. v. sol.	47°	....	leaflets......
35	insoluble	s. soluble	s. soluble	210–20°	dec.	leaflets......
36	soluble	....	....	....	....	....
37	soluble	s.col comb.	soluble	93.5°	....	needles.....
38	450 cc.	soluble	soluble	−34.4°	−20.7°	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Cyanogen bromide	$CNBr$	106.00	....
2	chloride	$CNCl$	61.49	1.+
3	iodide	CNI	153.01	....
4	sulphide	$(CN)_2S$	84.14	....
5	Cyan-propionic acid (α)	$CH_3.CHCN.CO_2H.1\frac{1}{2}H_2O$	126.11	....
6	Cyanuric acid	$C_3N_3H_3O_3+2H_2O$	165.19	1.768^{0}
7	Cyclo-hexane	$CH_2<(CH_2.CH_2)_2>CH_2$	82.10	$0.7843^{\frac{13}{4}}$
8	hexanol	$(CH_2)_5:CHOH$	100.10	....
9	hexanone	$(CH_2)_5:CO$	98.08	$0.9473^{\frac{20}{4}}$
10	pentadiëne	$CH_2<(CH:CH)_2>$	66.05	$0.8047^{\frac{19}{4}}$
11	pentene	$<(CH_2.CH_2)_2>CH_2$	68.06	$0.7754^{\frac{14}{4}}$
12	Cymene (o.)	$CH_3.C_6H_4.CH_2.CH_2CH_3$	134.12	$0.8748^{\frac{20}{20}}$
13	" (m.)	$CH_3.C_6H_4.CH:(CH_3)_2$	134.12	0.862^{20}
14	" (p.)	$CH_3.C_6H_4.CH:(CH_3)_2$	134.12	0.8597^{16}
15	" " (K.)	$CH_3.C_6H_4.CH:(CH_3)_2$	134.12	$0.853^{\frac{25}{25}}$
16	Dambose	$C_6H_6(OH)_6$	180.10	1.752
17	Deca-hydro-naphthaline	$C_{10}H_{18}$	138.15	0.877^{20}
18	Decane (n.)	$CH_3.(CH_2)_8CH_3$	142.18	0.7467^{20}
19	Decyl alcohol	$CH_3.(CH_2)_8.CH_2OH$	158.18	$0.8297^{\frac{20}{4}}$
20	Decylene (n.)	$CH_3.(CH_2)_7.CH:CH_2$	140.16	0.7630^{0}
21	Desoxalic acid	$CO_2H.CH(OH).C(OH).(CO_2H)_2$	194.05	....
22	Dextrin	$C_{12}H_{20}O_{10}$	324.16	1.0384
23	Diacetin	$(C_2H_3O_2)_2C_3H_5OH$	176.10	$1.1788^{\frac{15}{15}}$
24	Diacetyl	$CH_3.CO.CO.CH_3$	86.05	0.9734^{22}
25	dioxime (K.)	$[CH_3.C(NOH)]_2$	117.14	....
26	Diacetylene	$CH\vdots C.C\vdots CH$	50.02	....
27	dicarbonic acid	$(.C\vdots C.CO_2H)_2+H_2O$	156.04	....
28	Di-allyl	$(CH_2:CH.CH_2.)_2$	82.08	$0.6880^{\frac{20}{4}}$
29	carbinol	$(C_3H_5)_2CHOH$	112.10	0.8752^{0}
30	Diallylene	$C_3H_5.CH_2.C\vdots CH$	80.06	0.8579^{18}
31 32	Diamino-triphenyl methane (pp.)	$C_6H_5CH(C_6H_4NH_2)_2$	274.23	....
33	Diazo-amino-benzene	$C_6H_5.N.NH.N.C_6H_5$	197.21	....
34	benzene chloride	$C_6H_5.N_2Cl$	140.57	....
35	" nitrate	$C_6H_5.N_2NO_3$	167.16	....
36	" sulphonic acid (o.)	$C_6H_4:N_2SO_3$	184.17	....
37	" " " (m.)	$C_6H_4:N_2SO_3$	184.17	....
38	" " " (p.)	$C_6H_4:N_2SO_3$	184.17	....
39	methane	$CH_2:N_2$	42.08	....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	soluble	soluble	soluble	52°	61.3°^{760}	needles .....
2	2500 cc.	10,000 cc.	5000 cc.	−5°	15.5°	....
3	soluble	soluble	soluble	146.5°	....	long needles .
4	v. soluble	soluble	v. soluble *	60°	sub. 30°+	rhomb. tab. or leaf.
5	v. soluble	v. soluble	....	140° dec.	....	amorphous . .
6	0.25^{17}	0.349	....	....	....	monoclinic . .
7	....	....	....	6.2°	81–1.5°	....
8	3.56	....	soluble	20°	160–1° C.	needles......
9	v. soluble	....	....	−45°	155.5° C.	....
10	insoluble	∞	∞	....	42.5°	....
11	....	....	....	....	45–6°	oil..........
12	insoluble	soluble	....	....	181–2°	....
13	insoluble	soluble	....	< −25°	175–6°	....
14	insoluble	v. soluble	soluble	−73.5°	176.5°	....
15	insoluble	s. soluble	soluble	−73 5°	174–6°	....
16	s. soluble	ins. abs.	....	225° C.	319° in vac.	monoclinic/w
17	....	....	....	....	189–91°	....
18	....	....	....	−30–32°	173° C.	....
19	....	soluble	....	7°	231° C.	thick liquid. .
20	....	....	....	....	172°	....
21	v. soluble	v. soluble	....	....	dec.	cryst. mass. . .
22	v. soluble	insoluble	insoluble	....	....	amorphous . .
23	∞	v. soluble	∞,insol.CS_2	40°	259–61°	....
24	25^{15}	....	....	....	87.5–8°	yellow......
25	v. s. sol.	v. soluble	v. soluble	232–3°	....	colorless.....
26	....	....	....	....	....	....
27	mod. sol.	v. soluble	v. soluble	177° exp.	....	tab./al.+et..
28	insoluble	....	soluble	....	59.5° C.	....
29	v. v. s. sol.	....	....	....	151° C.	....
30	....	....	....	....	70°	....
31	v. v. s. sol.	v. soluble	v. soluble	139–40°	....	warts.......
32						
33	insoluble	soluble	v. soluble	96°	exp.	yellow leaf/al.
34	v. soluble	soluble	insoluble	dec.	....	needles .....
35	v. v. sol.	soluble	insoluble	exp.	....	needles......
36	0.0715^{25}	....	....	....	....	cryst. mass. .
37	v. soluble	....	....	exp.	....	red y. pris./w.
38	v. sol.^{60}	insoluble	....	....	....	sm. need./w.
39	decomp.	soluble	soluble	exp. 200°	0°	yellow......

* Very soluble carbon disulphide; mod. sol. chlo. and bz.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Diazo-phenol (p.)**	$C_6H_4N_2O+4H_2O$	192.17	....
2	**Dibenzyl**	$C_6H_5.CH_2.CH_2C_6H_5$	182.12	0.9752^{50}_{50}
3	amine	$NH(CH_2C_6H_5)_2$	197.16	1.0336^{15}_{15}
4	**Dibrom-acetic acid**	$CHBr_2.CO_2H$	217.94	....
5	anthracene	$C_6H_4.C_2Br_2.C_6H_4$	335.98	....
6	benzene (o.)	$C_6H_4Br_2$	235.95	1.977^{18}
7	" (m.)	$C_6H_4Br_2$	235.95	1.955^{19}
8	" (p.)	$C_6H_4Br_2$	235.95	2.220
9	propyl alcohol (K.)	$CH_2Br.CHBr.CH_2OH$	217.97	2.10^{20}_{15}
10	**Di-butyl carbonate**	$(C_4H_9)_2CO_3$	174.15	0.9244^{20}
11	**Di-butyl oxalate**	$(C_4H_9)_2C_2O_4$	202.15	1.010^{0}
12	**Dichlor-acetamide**	$CHCl_2.CONH_2$	127.97	....
13	acetic acid	$CHCl_2.CO_2H$	128.92	1.5724^{13}
14	acetone	$CHCl_2.CO.CH_3$	126.93	1.236^{21}
15	acetyl chloride	$CHCl_2.COCl$	147.36	....
16	aldehyde	$CHCl_2.CHO$	112.92	....
17	anthracene (β) (9, 10)	$C_{14}H_8Cl_2$	246.96	....
18	aniline (2, 4)	$NH_2C_6H_3Cl_2$	161.98	1.567
19	" (2, 5)	$NH_2C_6H_3Cl_2$	161.98	....
20	" (3, 4)	$NH_2C_6H_3Cl_2$	161.98	....
21	" (3, 5)	$NH_2C_6H_3Cl_2$	161.98	....
22	benzene (o.)	$C_6H_4Cl_2$	146.93	1.3254^{0}
23	" (m.)	$C_6H_4Cl_2$	146.93	1.307^{0}
24	" (p.)	$C_6H_4Cl_2$	146.93	1.2675^{15}_{15}
25	benzoic acid (2, 5)	$Cl_2C_6H_3.CO_2H$	190.93	....
26	" " (2, 6)	$Cl_2C_6H_3.CO_2H$	190.93	....
27	" " (3, 4)	$Cl_6C_6H_3.CO_2H$	190.93	....
28	ether	$CH_2Cl.CHCl.O.C_2H_5$	142.96	1.174^{23}
29	hydrine (1, 3)	$CH_2Cl.CHOH.CH_2Cl$	128.95	1.367^{19}
30	" (2, 3)	$CH_2Cl.CHCl.CH_2OH$	128.95	$1.355^{17.5}$
31	propane (2, 2)	$CH_3.CCl_2.CH_3$	112.95	1.827^{16}
32	stilbene	$C_{14}H_{10}Cl_2$	248.98	....
33	**Dicyan diamide (K.)**	$NH:C(NH_2).NH.CN$	84.19	....
34	diamidine sulphate (K.)	$[NH:C(NH_2).NH$	338.52	....
35	**Diethyl-acetic acid**	$CONH_2]_2.H_2SO_4+2H_2O$	116.10	0.9196^{18}_{0}
36	amine	$(C_2H_5)_2HC.CO_2H$	73.13	0.7226^{4}
37	" (K.)	$(C_2H_5)_2NH$	73.13	0.7028^{25}_{25}
38	aniline	$(C_2H_5)_2NH$	149.16	0.9351^{20}_{4}
39	" (K.)	$(C_2H_5.)_2NC_6H_5$	149.16	0.993^{25}_{25}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	v. soluble	v. soluble	s. soluble	38–9° exp.	....	yellow need
2	sol. CS_2	mod. sol.	v. soluble	51.8°	284°	monoclinic...
3	insoluble	v. soluble	v. soluble	....	269°^{250} C.	....
4	v. soluble	v. soluble	v. soluble	48°	232–4°	crystals.....
5	sol. hot bz.	s. soluble	s. soluble	221°	subl.	yel. need./tol.
6	....	soluble	....	−1°	223.8°^{752}	....
7	....	soluble	soluble	1–2°	219.4°^{758}	....
8	....	14^{30}	....	89.3° C.	219°	moncl. tab..
9	insoluble	v. soluble	∞	....	218–21°	wh. → yel...
10	....	....	....	....	207.7° C.	....
11	....	....	....	....	243.4° C.	....
12	v. sol. hot	v. soluble	v. soluble	98°	233–4°^{745}	moncl. prisms
13	soluble	soluble	soluble	−4°	189–91°	....
14	soluble	....	....	....	120°	....
15	....	....	....	....	107–8°	....
16	insoluble	....	....	....	89.5–90.5°	....
17	sol. bz.	s. soluble	s. soluble	209°	....	yel. needles..
18	....	soluble	....	63°	245° C.	need./dil. al..
19	....	soluble	....	50°	251°	needles/lig...
20	s. sol. lig.	soluble	....	71.5°	272°	needles/lig...
21	....	soluble	....	50.5°	259–60°	needles......
22	....	soluble	....	< −14°	179°	....
23	....	soluble	soluble	−18°	172°^{767}	....
24	v. sol. bz.	∞	v. soluble	53°	173.7° C.	mon.leaf./al..
25	0.09^{11}	soluble	....	156°	301°	needles/w. ..
26	....	....	....	126.5°	....	sm. needles..
27	v. s. sol.	v. s. sol.	....	203°	dist.	fine need./w..
28	....	....	∞	....	140–5°	....
29	1.1^{19}	∞	∞	....	182°	....
30	....	....	....	....	182°	....
31	....	∞ CS_2	....	....	69.7°	....
32	....	v. sol. hot	v. soluble	170°	....	silk. need. or leaflets
33	(2.26^{13})	(1.26^{13} abs)	(0.01^{13} abs)	204–5°	....	leaf. and tab.
34	soluble	insoluble	insoluble	....	....	sm. wh. need.
35	s. soluble	....	....	< −15°	190°^{756}	....
36	v. soluble	soluble	....	−40°	55.5°	....
37	soluble	soluble	soluble	−40°	55–7°	....
38	insoluble	soluble	soluble	−38.8° C.	213.5°^{760}	oil..........
39	insoluble	soluble	∞	−38–9°	215.0–6.5°	usually yel...

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Diethyl-benzene** (o.)	$C_6H_4(C_2H_5)_2$	134.12	0.8662^{18}_{4}
2	" (m.)	$C_6H_4(C_2H_5)_2$	134.12	0.8602^{20}_{4}
3	" (p.)	$C_6H_4(C_2H_5)_2$	134.12	0.8675^{14}_{4}
4	carbinol	$(C_2H_5)_2CHOH$	88.10	0.8312^{0}
5	fumarate	$(C_2H_5)_2C_4H_2O_4$	172.10	1.063^{10}
6	glutaconate	$(C_2H_5)_2C_5H_4O_4$	186.12	1.0499^{20}_{4}
7	isosuccinate	$(C_2H_5)_2C_4H_4O_4$	174.12	1.0213^{15}
8	itaconate	$(C_2H_5)_2C_5H_4O_4$	186.12	1.0504^{15}
9	ketone	$C_2H_5.CO.C_2H_5$	86.08	0.8335^{0}_{4}
10	" (K.)	$C_2H_5.CO.C_2H_5$	86.08	0.8140^{25}_{15}
11	maleate	$(C_2H_5)_2C_4H_2O_4$	172.10	1.0740^{15}
12	malonic acid	$(C_2H_5)_2C.(CO_2H)_2$	160.10	....
13	mesaconate	$(C_2H_5)_2C_5H_4O_4$	186.12	1.0492^{15}
14	mesoxalate	$(OH)_2C(CO_2C_2H_5)_2$	192.10	....
15	oxamide (K.)	$(.CO.NHC_2H_5)_2$	144.18	....
16	phosphine	$(C_2H_5)_2PH$	90.09	<1
17	sulphite	$(C_2H_5)_2SO_3$	138.14	1.1063^{0}
18	toluene (s.)	$(C_2H_5)_2C_6H_3CH_3$	148.13	0.879^{20}
19	urea	$CO(NHC_2H_5)_2$	116.18	1.0415
20	" (uns.)	$NH_2.CO.N(C_2H_5)_2$	116.18	....
21	**Diethylene glycol**	$(CH_2OH.CH_2)_2O$	106.08	1.132^{0}
22	**Difluor benzene** (p.)	$C_6H_4F_2$	114.03	1.11
23	**Diglycerine**	$C_6H_{14}O_5$	166.12	....
24	**Diglycolic acid**	$(CO_2H.CH_2)_2O + H_2O$	152.07	....
25	**Diguanid**	$HN<[.C(NH_2):NH]_2$	101.26	....
26	**Dihydro-anthracene**	$C_6H_4:(CH_2)_2:C_6H_4$	180.10	....
27	benzaldehyde (△ 4, 6)	C_7H_8O	108.06	1.0327^{0}
28	benzene (1, 2)	C_6H_8	80.06	0.8478^{20}_{4}
29	naphthaline	$C_{10}H_8.H_2$	130.08	....
30	phthalic acid (△ 2, 4)	$o.C_6H_6(CO_2H)_2$	168.06	....
31	quinoline	C_9H_9N	131.11	....
32	resorcine	$C_6H_6O_2.H_2$	112.06	....
33	terephthalic ac. (△1, 4)	$C_6H_6(CO_2H)_2$	168.06	....
34	toluene (△ 1, 3)	$CH_3.C_6H_7$	94.08	0.8354^{20}_{4}....
35	-xylene (o.)	$(CH_3)_2C_6H_6$	108.10	....
36	" (m.)	$(CH_3)_2C_6H_6$	108.10	0.8275^{20}
37	" (p.)	$(CH_3)_2C_6H_6$	108.10	....
38	**Dihydroxy-benzoic acid**	$(OH)_2C_6H_3CO_2H + 2H_2O$	190.08	....
39	(2, 3)			
40	benzoic acid (2, 4)	$(OH)_2C_6H_3CO_2H + 3H_2O$	208.10	....
41	" " (2, 5)	$(OH)_2C_6H_3CO_2H$	154.05	....

* Very soluble benzene and ligroene.

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	...	...	...	< −20°	184–4.5°	...
2	...	...	...	< −20°	181–2°	...
3	insoluble	soluble	soluble	< −20°	182–3°	...
4	...	...	...	...	$116.5^{\circ 753}$	...
5	...	...	...	...	218.5° C.	...
6	...	...	soluble	...	236–8°	...
7	...	...	...	...	198.5–9.5°	...
8	...	...	...	...	227.8° C.	...
9	soluble	...	soluble	...	103°	...
10	4.1	∞	∞	...	101–2°	...
11	4.1	...	...	...	223.03° C.	...
12	65^{16}	v. soluble	v. soluble	121–5°	...	prisms......
13	...	...	...	...	229° C.	...
14	insoluble	...	...	57°	abt. 200°	...
15	s. soluble	soluble	v. s. sol.	179–80°	...	wh. needles..
16	...	...	...	...	85°	...
17	insoluble	soluble	soluble	...	161.3°	...
18	...	...	...	...	199–200°	...
19	v. soluble	v. soluble	v. soluble *	112.5°	263°	prisms......
20	deliq.	v. soluble	v. soluble	70°	...	prisms......
21	soluble	soluble	soluble	...	25.0°	...
22	...	...	...	...	87–9°	...
23	v. soluble	...	insoluble	...	$220–30^{\circ 11}$	thick liquid..
24	v. soluble	v. soluble	soluble	148°	decomp.	rhomb. pris. .
25	...	...	...	...	...	amorphous . .
26	insoluble	v. soluble	v. soluble	108.5°	313°	triclinic.....
27	...	...	...	< −20°	170–1° dec.	oil..........
28	...	soluble	...	...	82°–85°	oil..........
29	...	...	...	15.5°	212°	...
30	0.2^{10}, 16^{100}	soluble	s. soluble	215°	...	moncl. tab...
31	...	...	...	220–6°	...	yellow.......
32	v. soluble	v. soluble	v. s. sol.†	104-6 sl.dec	...	prisms/bz. . .
33	0.0006	...	...	no m.p.	...	fine needles. .
34	...	v. soluble	soluble	...	$110–0.5^{\circ 770}$	...
35	...	...	soluble	...	134–5°	...
36	...	...	...	...	132–4°	...
37	...	...	...	...	134–5°	...
38	soluble	...	...	204°	decomp.	needles
39						
40	0.263^{17}	v. soluble	v. soluble	213° dec.	decomp.	needles/eth..
41	sol. hot.	v. soluble	v. soluble	200°	decomp.	need. or pris..

† V. sol. chlo., acetone, and hot benz.; v. s. sol. CS_2 and lig.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Dihydroxy-			
2	benzoic acid (3, 5)	$(OH)_2C_6H_3CO_2H + 1\frac{1}{2}H_2O$	181.08	....
3	benzophenone (2, 4) ..	$(C_6H_4OH)_2CO$	214.08	....
4	" (3, 3') ..	$(C_6H_4OH)_2CO$	214.08	....
5	" (4, 4') ..	$(C_6H_4OH)_2CO$	214.08	....
6	butane (2, 3)	$CH_3.CHOH.CHOH.CH_3$	90.08	....
7	naphthaline (1, 6)	$(OH)_2C_{10}H_6$	160.06	....
8	" (1, 7)	$(OH)_2C_{10}H_6$	160.06	....
9	" (1, 8)	$(OH)_2C_{10}H_6$	160.06	....
10	" (2, 3)	$(OH)_2C_{10}H_6$	160.06	....
11	" (2, 7)	$(OH)_2C_{10}H_6$	160.06	....
12	pyridine (2, 4)	$C_5H_3N(OH)_2$	111.08	....
13	" (2, 6)	$C_5H_3N(OH)_2 + \frac{1}{2}H_2O$	120.09	....
14	quinone (2, 5)	$C_6H_2O_2(OH)_2$	140.03	....
15	toluene (2, 5)	$CH_3C_6H_3(OH)_2$	124.06	....
16	" (2, 6)	$CH_3C_6H_3(OH)_2$	124.06	....
17	" (2, 4)	$CH_3C_6H_3(OH)_2$	124.06	....
18	Diiodo-acetic acid	$CHI_2.CO_2H$	311.96	....
19	acetylene	IC: CI	277.94	....
20	benzene (o.)	$C_6H_4I_2$	329.97	....
21	" (m.)	$C_6H_4I_2$	329.97	....
22	" (p.)	$C_6H_4I_2$	329.97	....
23	diacetylene	.IC: C.C:CI	301.94	....
24	hexane (1, 6)	$ICH_2(CH_2)_4CH_2I$	338.04	....
25	Diiso-amyl	$(CH_3)_2CHCH_2CH_2)_2$	142.18	0.7479^{20}
26	amyl amine (K.)	$[(CH_3)_2CH.CH_2.CH_2]_2NH$	157.22	0.766^{25}_{25}
27	amyl carbonate	$(C_5H_{11})_2CO_3$	202.18	0.912^{15}
28	amyl ketone	$(C_5H_{11})_2CO$	170.18	....
29	butyl amine	$(C_4H_9)_2NH$	129.20	0.7491^{15}
30	butyl carbonate	$(C_4H_9)_2CO_3$	174.15	0.919^{15}
31	butylene	$(CH_3)_2C: CHC(CH_3)_3$	112.13	0.7158^{21}
32	butyl oxalate	$(C_4H_9)_2C_2O_4$	202.15	1.002^{14}
33	propyl carbinol	$[(CH_3)_2CH]_2CHOH$	116.13	0.8288^{20}_{4}
34	propyl ketone	$[(CH_3)_2CH]_2CO$	114.12	0.8062^{20}_{4}
35	Dimethyl allene (1, 1) ...	$(CH_3)_2C: C: CH_2$	68.06	0.6940^{20}_{4}
36	" amine	$(CH_3)_2NH$	45.10	0.6865^{-6}
37	" " (K.)	$(CH_3)_2NH$	45.10	$0.6865^{-5.8}_{15}$
38	aniline	$C_6H_5N(CH_3)_2$	122.13	0.9621^{15}_{15}
39	" (K.)	$C_6H_5N(CH_3)_2$	122.13	0.954^{25}_{25}
40	anthracene (2, 3)	$(CH_3)_2C_{14}H_8$	206.12	....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	mod. sol.	v. soluble	v. soluble	232–3°	....	pris. or need..
2						
3	s. sol. hot	sol. alk.	v.sol.sol.bz.	143–4°	....	pyramid/bz.
4	soluble	soluble	sol. alk.	162–3°	....	small needles
5	v. sol. hot	v. soluble	v. soluble *	210°	dist. undec.	yel. need./lig.
6	....	....	....	....	183–4°	....
7	v. sol. bz.	s. soluble	v. soluble	134–5°	....	short pris./bz.
8	mod. sol.	v. soluble	v. soluble	178°	....	sm. need./bz.
9	v. sol. bz.	....	v. soluble	140°	....	need. or leaf..
10	sol. hot	v. soluble	v. soluble	160–1°	....	rhombic/al. .
11	sol. hot	v. soluble	v. soluble	190°	subl. pt. de.	long needles .
12	s. soluble	s. soluble	v. v. s. sol.	260–5°	....	rhomb./al. . .
13	s. soluble	s. soluble	v. s. sol.	195°	....	yel. need./w..
14	v. v. s. sol.	v. soluble	v. s. sol.	215–20°	sublimes	yel. needles. .
15	v. v. sol.	v. v. sol.	v. v. sol.	125°	part. subl.	leaflets......
16	v. soluble	v. soluble	....	63–6°	....	needles......
17	v. soluble	v. soluble	v. soluble	103–4°	267–70°	....
18	s. soluble	....	....	110°	....	yel. crystals .
19	v. sol. lig.	v. soluble	v. soluble	82°	volatile	clear need/lig
20	....	soluble	....	27°	286.5 C.^{0751}	pris. or tab...
21	....	soluble	sol. chlo.	40.4°	284.7^{0756}	rhomb. tab. /al.+et.
22	....	soluble	....	129.4°	285° C.	leaflets......
23	....	....	soluble	101°	....	crystalline...
24	....	....	....	6–7°	with steam	....
25	....	....	....	....	159.66°	....
26	s. soluble	soluble	∞	....	185–9°	colorless to yellowish
27	....	....	....	....	228.7° C.	
28	....	....	....	....	226°	yellow oil....
29	....	....	....	....	139–40°	....
30	....	....	....	....	190.3° C.	....
31	....	....	....	....	102.5° C.^{756}	....
32	....	....	....	....	229°	....
33	v. s. sol.	soluble	soluble	....	140°	........[/bz.
34	sol. bz.	sol. toluene	....	....	123.7°	irreg. cryst.
35	....	....	....	....	40.5–1.5°	....
36	soluble	soluble	....	....	7.2–7.3°	....
37	v. soluble	v. soluble	soluble	....	7–7.3°	....
38	....	soluble	soluble	2.5°	193.1^{0760}	....
39	....	soluble	∞	2–2.5°	192.5–3.5°	yellowish....
40	v. sol. bz.	....	....	246°	....	fluoresc. leaf.

* V. sol. acetone and alkalies; v. s. sol. bz., chlo. and CS_2.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Dimethyl-anthracene (2,4)	$(CH_3)_2C_{14}H_8$	206.12	....
2	arsine	$(CH_3)_2AsH$	106.06	1.213^{29}
3	benzoic acid (2, 3)	$(CH_3)_2C_6H_3.CO_2H$	150.08	....
4	" " (3, 4)	$(CH_3)_2C_6H_3.CO_2H$	150.08	....
5	" " (2, 4)	$(CH_3)_2C_6H_3.CO_2H$	150.08	....
6	" " (2, 6)	$(CH_3)_2C_6H_3.CO_2H$	150.08	....
7	" " (2, 5)	$(CH_3)_2C_6H_3.CO_2H$	150.08	....
8	carbonate	$(CH_3)_2CO_3$	90.05	1.069^{22}
9	ethyl acetic acid	$(CH_3)_2(C_2H_5).C.CO_2H$	116.10	....
10	" benzene (s.)	$C_2H_5.C_6H_3.(CH_3)_2$	134.12	0.861^{20}
11	" benzene (3, 4)	$C_2H_5.C_6H_3.(CH_3)_2$	134.12	0.8783^{20}
12	" ethylene	$(CH_3)_2C:CH.C_2H_5$	84.10	0.687^{19}
13	fumarate	$(CH_3)_2C_4H_2O_4$	144.06	....
14	isophthalate	$(CH_3)_2C_8H_4O_4$	194.08	....
15	isopropyl carbinol	$(CH_3)_2(C_3H_7)COH$	102.12	0.8232^{19}
16	maleate	$(CH_3)_2C_4H_2O_4$	144.06	1.1529^{14}
17	malonic acid	$(CH_3)_2C(CO_2H)_2$	132.06	....
18	naphthaline (1, 4)	$(CH_3)_2C_{10}H_6$	156.10	1.1803^{16}_{4}
19	" (β)	$(CH_3)_2C_{10}H_6$	156.10	1.008
20	α-naphthylamine	$C_{10}H_7N(CH_3)_2$	171.15	1.0446^{15}_{15}
21	β- "	$C_{10}H_7N(CH_3)_2$	171.15	1.0455^{40}_{40}
22	nitros-amine	$(CH_3)_2N.NO$	74.13	....
23	oxamide (K.)	$(.CO.NHCH_3)_2$	116.14	....
24	pentene (2) (2, 3)	$(CH_3)_2C:(CH_3)C_2H_5$	98.12	0.7185^{21}
25	" (2) (2, 4)	$(CH_3)_2C:CH.CH(CH_3)_2$	98.12	0.6985^{14}
26	phosphine	$(CH_3)_2PH$	62.06	<1
27	phosphinic acid	$(CH_3)_2PO.OH$	94.06	....
28	phthalate (o.)	$C_6H_4(CO_2CH_3)_2$	194.08	....
29	propyl carbinol	$(CH_3)_2.C(OH).C_3H_7$	102.12	....
30	quinone (2, 3)	$(CH_3)_2C_6H_2O_2$	136.06	....
31	" (2, 6)	$(CH_3)_2C_6H_2O_2$	136.06	....
32	" (2, 5)	$(CH_3)_2C_6H_2O_2$	136.06	....
33	racemate	$(CH_3)_2C_4H_4O_6$	178.08	....
34	succinic acid (uns.)	$(CH_3)_2C(CO_2H)CH_2CO_2H$	146.08	....
35	tartrate	$(CH_3)_2C_4H_4O_6$	178.08	1.3403^{15}
36	terephthalate (p.)	$C_6H_4(CO_2CH_3)_2$	194.08	....
37	thiophene (2, 4)	$(CH_3)_2C_4H_2S$	112.12	0.9956^{20}
38	" (2, 5)	$(CH_3)_2C_4H_2S$	112.12	0.9859^{19}_{4}
39	trimethylene (1, 1)	$(CH_3)_2C:(CH_2)_2$	70.08	0.6604^{20}_{4}
40	urea (sym.) (K.)	$CO<(NHCH_3)_2$	88.14	....
41	" (uns.) (K.)	$NH_2.CO.N(CH_3)_2$	88.14	....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	v. sol. bz.	mod. sol.	....	71°	....	fine need./al.
2	∞ bz.	∞, ∞ CS_2	∞, ∞ chlo.	....	36–7°	....
3	v. sol. hot	soluble	....	144°	....	glassy pris./al
4	v. v. s. sol.	v. s. sol.	....	163–5°	....	prisms/al....
5	v. v. s. sol.	soluble	soluble	126°	268°	moncl.pris./a
6	s. soluble	....	v. soluble	116°	....	short need/w.
7	v. s. sol. hot	v. soluble	....	132°	268° C.	long need./al.
8	insoluble	....	....	0.5°	89.70°	....
9	insoluble	soluble	soluble	–14°	187°	....
10	....	....	....	< –20°	185°	....
11	....	....	....	....	183–4°	....
12	....	....	....	....	65–7°^{757}	....
13	....	s. soluble	s. soluble	102°	192° C.	triclin. prisms
14	....	....	....	67–8°	dist.	....
15	soluble	soluble	....	–14°	117.6°	....
16	....	....	....	....	205° C.	....
17	10	s. soluble	v. soluble	192–3° dec.	sub. 120°+	quadrat. pris.
18	....	....	....	< –18°	262–4°	....
19	....	....	....	–20°	264–6°	....
20	insoluble	soluble	soluble	....	274.5° C.^{711}	....
21	....	....	....	46°	305°, 212°^{69}	crystalline...
22	....	....	....	....	153°^{774}	yellow oil....
23	s. soluble	s. soluble	v. s. sol.	209–10°	....	wh. needles..
24	....	....	....	....	75–80°	....
25	....	....	....	....	83–4°	....
26	insoluble	....	....	....	25°	....
27	v. soluble	....	....	76°	....	crystalline...
28	....	....	....	....	282°	....
29	....	soluble	....	< –38°	122.5-3.5°^{762}	....
30	s. soluble	mod. sol.	mod. sol.	55°	sublimes	yellow need..
31	....	....	....	72–3°	....	yel. needles..
32	s. sol. hot	s. soluble	v. soluble	125°	sublimes	tricl. pris. /al.
33	....	soluble	....	85°	282°	monoclinic/al
34	7.52^{14}	v. soluble	s. soluble	142°	165°→anh.	tricl. pris./bz.
35	soluble	v. soluble	sol. chlo.	48°	280°	crystalline...
36	0.33	....	....	140°	....	trimetric need
37	....	....	....	....	137–8° C.	....
38	....	....	....	....	136.5-7.5°C.	....
39	....	....	....	....	21°	....
40	v. soluble	soluble	insoluble	99–101°	....	thin prisms..
41	v. soluble	soluble	insoluble	180–1°	....	thin prisms..

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Dinaphthol** (α)	$OH.C_{10}H_6.C_{10}H_6OH$	286.12	
2	**Dinaphthol** (β)	$OH.C_{10}H_6.C_{10}H_6OH$	286.12	
3	**Dinaphthyl** (αα)	$(C_{10}H_7)_2$	254.12	
4	**Dinaphthylmethane** (α)	$(C_{10}H_7)_2CH_2$	268.13	
5	" (β)	$(C_{10}H_7)_2CH_2$	268.13	
6	**Dinicotinic** acid	1: 2: $4C_5H_3N(CO_2H)_2$	167.08	
7	**Dinitraniline** (2, 4)	$(NO_2)_2C_6H_3NH_2$	183.16	1.615^{14}
8	**Dinitro**-benzene (o.)	$C_6H_4(NO_2)_2$	168.11	1.565^{17}
9	" (m.)	$C_6H_4(NO_2)_2$	168.11	1.546^{17}
10	" (p.)	$C_6H_4(NO_2)_2$	168.11	1.587^{17}
11	benzoic acid (2, 4)	$(NO_2)_2C_6H_3.CO_2H$	212.11	
12	" " (2, 5)	$(NO_2)_2C_6H_3.CO_2H$	212.11	
13	" " (2, 6)	$(NO_2)_2C_6H_3.CO_2H$	212.11	
14	" " (3, 5)	$(NO_2)_2C_6H_3.CO_2H$	212.11	
15	diphenyl (o.p.)	$NO_2C_6H_4.C_6H_4NO_2$	244.14	
16	" (p.p.)	$NO_2C_6H_4.C_6H_4NO_2$	244.14	
17	methane	$CH_2(NO_2)_2$	106.10	
18	phenol (2, 3)	$(NO_2)_2C_6H_3OH$	184.11	
19	" (2, 4)	$(NO_2)_2C_6H_3OH$	184.11	1.683^{24}
20	" (2, 6)	$(NO_2)_2C_6H_3OH$	184.11	
21	toluene (2, 4)	$(NO_2)_2C_6H_3.CH_3$	182.13	1.3208^{0}
22	" (3, 4)	$(NO_2)_2C_6H_3.CH_3$	182.13	1.32
23	" (3, 5)	$(NO_2)_2C_6H_3.CH_3$	182.13	
24	**Dioxindole**	$C_8H_7NO_2$	149.10	
25	**Diphenol** (α) (o.o.)	$OHC_6H_4.C_6H_4OH$	186.08	
26	" (β) (m.m.)	$OHC_6H_4.C_6H_4OH$	186.08	
27	" (γ) (p.p.)	$OHC_6H_4.C_6H_4OH$	186.08	
28	" (δ)	$OHC_6H_4.C_6H_4OH$	186.08	
29	**Diphenyl**	$C_6H_5.C_6H_5$	154.08	0.9845^{82}
30	acetic acid	$(C_6H_5)_2CH.CO_2H$	212.10	
31	anime	$(C_6H_5)_2NH$	169.13	1.159
32	benzene (p.)	$C_6H_5.C_6H_4.C_6H_5$	230.12	
33	carbonate (K.)	$(C_6H_5)_2CO_3$	214.08	
34	diacetylene	$C_6H_5.C⋮C.C_6H_5$	202.08	
35	ethane (u.)	$CH_3.CH(C_6H_5)_2$	182.12	1.0033^{20}_{0}
36	hydrazine (αα)	$(C_6H_5)_2N.NH_2$	184.18	1.190^{16}
37	methane	$(C_6H_5)_2CH_2$	168.10	1.0056^{25}_{25}
38	phosphine	$(C_6H_5)_2PH$	186.09	1.0126^{11}_{4}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	insoluble	mod. sol.	v. soluble	300°	....	rhombic tab.
2	insoluble	mod sol.	v. soluble	218° C.	sub. nd.	flat nd. or pr.
3	v. sol. bz.	mod. sol.	mod. sol.	160.5° C.	abt. 360°	rhomb. leaf.
4	sol. $CHCl_3$	0.8^{20}	v. sol. bz.	109°	above 360°	short pris./al.
5	....	v. soluble	sol. bz.	92°	....	fine needles..
6	v. s. sol.	....	....	323°	decomp.	....
7	insoluble	0.7^{21}	....	187.5–8°	....	yel. moncl....
8	0.38^{100}	3.8^{25}: 33^{78} abs.	27.1^{18}chlo.	117.9°	$319°^{773}$	monocl. tab..
9	32.4^{18} chlo.	$3.5^{20.5}$	39.45^{18}bz.	89.95° C.	$302.8°^{770}$	thin rhb. tab.
10	0.18^{100}	$0.4^{20.5}$	*1.82^{18}chlo.	172–3°	$299°^{777}$	moncl. need..
11	1.85^{25}	v. soluble	....	179°	....	rhomb. tab. or prisms
12	s. sol. hot	....	....	177°	....	needles
13	mod.sol. hot	....	....	202° dec.	....	needles
14	2.0^{100}	v. soluble	s. soluble	204–5°	....	quad. tab./w.
15	....	v. sol. hot	....	93.5°	....	moncl. need.
16	....	mod.sol.hot	v. soluble	234–5°	....	fine needles..
17	soluble	....	....	$< -15°$	exp. 100°	yel. crystals.
18	s. soluble	soluble	v. soluble	144°	....	yel. need/w..
19	0.5	3.9^{19}	v. soluble	114–5°	....	yel. tab./w...
20	s. soluble	soluble	v. soluble	61.78°	....	yel.need./w..
21	insoluble	s. soluble	$2.19^{17}CS_2$	70.5°	....	moncl. need..
22	insoluble	soluble	$2.19^{17}CS_2$	61°	....	long need.CS_2
23	s. soluble	mod. sol.	v. soluble mod.sol.CS_2	92–3°	with steam	moncl. pris. /lig.
24	8.3	6.6	sol. alk.	180°	dec. 195°	rhomb. pris..
25	mod.sol. hot	v. soluble	v. soluble	123°	$315°^{768}$	long flat need.
26	s. soluble	v. soluble	v. soluble	190°	....	small leaflets.
27	s. soluble	v. soluble	v. soluble	272°	sublimes	glit. leaf./al.
28	v. s. sol.	v. soluble	v. soluble	161°	342°	mon. prisms.
29	insoluble	9.98	soluble	70.5°	254.93° C.	moncl. tab...
30	s. soluble	v. soluble	v. soluble	148°	part. sub.	needles/w....
31	s. soluble	soluble	soluble	52.85°	310°	moncl. leaf...
32	sol. hot bz.	v. s. sol.	s. soluble	205°	383–427°	small leaflets
33	insoluble	soluble	v. soluble	80–1°	....	wh. needles..
34	....	v. soluble	v. soluble	96°	....	need. dil. al.
35	....	....	....	....	286°	oil..........
36	v. s. sol.	v. soluble	v. soluble	44°	$220°/^{40}$	triclin./lig...
37	insoluble	v. soluble	v. soluble	26.5°	264.7° C.	prismat. need.
38	insoluble	v. soluble	v. soluble	....	280°	oil..........

* 0.69 parts dissolve in 100 parts methyl alcohol at 20°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
	Diphenyl			
1	sulpho-urea (K.)	$CS<(NH.C_6H_5)_2$	228.24	....
2	m. tolyl-methane	$(C_6H_5)_2CH.C_6H_4.CH_3$	258.15	1.07^{16}
3	urea (uns.)	$NH_2.CO.N(C_6H_5)_2$	212.18	....
4	Diphenylene oxide	$<(C_6H_4)_2O$	168.08	....
5	Dipicolinic acid	$1:2:6C_5H_3N(CO_2H)_2 + 1\frac{1}{2}H_2O$	194.07	....
6	Dipropargyl	$CH\vdots C.CH_2.CH_2C\vdots CH$	78.05	0.8049^{20}_{4}
7	Dipropyl amine	$(C_3H_7)_2NH$	101.16	0.7357^{25}
8	" (K.)	$(C_3H_7)_2NH$	101.16	0.736^{25}_{25}
9	carbinol	$(C_3H_7)_2CHOH$	116.13	0.8200^{20}
10	ketone	$(C_3H_7)_2CO$	114.12	$0.8205\frac{15.1}{4}$
11	" (K.)	$(C_3H_7)_2CO$	114.12	0.822^{25}_{25}
12	oxalate	$(C_3H_7)_2C_2O_4$	174.12	1.0384°
13	Dipyridyl (γ)	$C_5H_4N.C_5H_4N$	156.16	....
14	Diquinoline	$C_9H_7N.C_9H_7N$	258.20	....
15	Diquinoyl (2, 3^1)	$C_9H_6N.C_9H_6N$	256.18	....
16	" (6, 6^1)	$C_9H_6N.C_9H_6N$	256.18	....
17	" (7, 2^1)	$C_9H_6N.C_9H_6N$	256.18	....
18	Diresorcine	$.[C_6H_3.(OH)_2]_2+2H_2O$	254.12	....
19	Dithio-glycerine	$C_3H_5(OH)(SH)_2$	124.18	$1.342^{14.4}$
20	Ditolyl (o.)	$CH_3.C_6H_4.C_6H_4.CH_3$	182.12	....
21	" (o.m.)	$CH_3.C_6H_4.C_6H._4CH_3$	182.12	0.9993^{10}_{4}
22	" (m.)	$CH_3.C_6H_4.C_6H._4CH_3$	182.12	....
23	" (p.p.)	$CH_3.C_6H_4.C_6H._4CH_3$	182.12	0.9172^{121}
24	amine (o.)	$(CH_3C_6H_4)_2NH$	197.16	....
25	" (m.)	$(CH_3C_6H_4)_2NH$	197.16	....
26	" (p.)	$(CH_3C_6H_4)_2NH$	197.16	....
27	sulpho-urea (o.) (K.)	$CS<(NH.C_6H_5.CH_3)_2$	256.27	....
28	" (p.) (K.)	$CS<(NH.C_6H_5.CH_3)_2$	256.27	....
29	Divinyl	$CH_2:CH.CH:CH_2$	54.05	....
30	Docosane	$CH_3.(CH_2)_{20}.CH_3$	310.37	0.7782^{44}_{4}
31	Dodecane, n	$CH_3.(CH_2)_{10}.CH_3$	170.22	0.7684^{20}
32	Dodecylene, n	$C_{12}H_{24}$	168.20	0.7854^{20}
33	Dulcite	$C_6H_8(OH)_6$	182.12	1.466^{15}
34	Durol	$1:2:4:5C_6H_2(CH_3)_4$	134.12	0.8380^{81}_{4}
35	Elaïdic acid	$C_8H_{17}CH:CH(CH_2)_7CO_2H$	282.28	0.8505^{79}_{4}
36	Ellagic acid	$C_{14}H_6O_8+2H_2O$	338.08	1.667^{18}
37	Eosine	$C_{20}H_8Br_4O_5$	647.90	....
38	α-Epichlorhydrine	C_3H_5ClO	92.49	1.2031^{0}_{4}
39	α-Epidichlorhydrine (K.)	$CH_2:CCl.CH_2Cl$	110.93	1.209^{25}_{25}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	v. s. sol.	s. soluble	v. s. sol.	153–4°	....	prisms ......
2	sol. bz.	s. soluble	v. soluble	60.5–1.5°	$354^{\circ 706}$	irreg. prisms.
3	s. soluble	soluble	soluble	189°	....	long needles..
4	insoluble	mod. sol.	v. soluble	86–7°	287–8°	small. leaf./al
5	sol. hot	v. s. sol.	....	226° dec.	....	crusts, scales or needles
6	....	....	v. soluble	−6°	85.4°	....
7	s. soluble	....	....	< −50°	109.4–10.4	....
8	soluble	∞	soluble	....	109.5–10.5	colorless.....
9	....	soluble	soluble	....	154°	....
10	insoluble	....	....	....	143.52°	....
11	insoluble	∞	∞	....	141–3°	colorless.....
12	....	....	....	....	213.5° C.	....
13	v. s. sol.	v. soluble	v. soluble	111–2°	304.8°	need. or tab..
14	insoluble	v. soluble	v. soluble	114°	....	yel. needles. .
15	insoluble	v. soluble	mod. sol.	176–7°	> 400°	m'cl.tab.&nd.
16	v. s. sol. hot	v. s. sol.	v. s. sol.	178°	dist.	mon. tab./al.
17	insoluble	v. s. sol.	s. soluble	192.5°	sublimes	mon. tab./al.
18	s. soluble	ins. acet.	soluble	310°	....	need. or pw..
19	insoluble	v. sol. abs.	insoluble	....	dec. 130°	thick liquid..
20	....	....	....	....	272°	....
21	....	v. soluble	v. soluble	....	288°	....
22	....	....	....	....	280–1°	....
23	sol. CS_2	soluble	soluble	121°	dist.	moncl. pris. /et.
24	....	....	....	....	$312^{\circ 727}$	
25	....	v. soluble	v. soluble	< −12°	319–20°	....
26	....	....	....	79°	330.5°	long needles .
27	v. s. sol.	s. soluble	v. s. sol.	157.5–8.5°	....	v. sm. need..
28	v. s. sol.	s. soluble	v. s. sol.	176–7°	....	v. sm. need..
29	....	....	....	....	1°	....
30	....	4^{78}	....	44.4°	317.4°....	cryst./al ....
31	....	....	....	−12°	214.5° C.	....
32	....	....	....	−31.5°	213–5°	....
33	2.14, 56^{100}	0.7	insoluble	188.8° C.	$279–80^{\circ 1}$C.	moncl. prisms
34	....	v. soluble	v. soluble	79–80°	196°	crystalline...
35	insoluble	soluble	soluble	51.5°	$234^{\circ 15}$, $154^{\circ 0}$	leaflets/al....
36	v. s. sol. hot	s. soluble	insoluble	decompose	....	yel. cryst. po..
37	insoluble	soluble	sol. acet. ac	....	....	moncl. need..
38	insoluble	....	soluble	....	116° C.	....
39	insoluble	∞	∞	....	95.5–6.5°	colorless.....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Erucic acid**	$C_8H_{17}CH:CH(CH_2)_{11}CO_2H$	338.34	0.8602^{55}_{4}
2	**Erythrite**	$(CH_2OH.CHOH.)_2$	122.08	1.59
3	anhydride	$C_4H_6O_2$	86.05	1.1132^{18}
4	**Ethane**	$CH_3.CH_3$	30.05	0.446^{0} liq.
5	**Ether**	$C_2H_5OC_2H_5$	74.08	0.7111^{22}
6	**Ethoxy-benzoic acid** (o.)	$C_2H_5O.C_6H_4.CO_2H$	166.08	....
7	" " (m.)	$C_2H_5O.C_0H_4.CO_2H$	166.08	....
8	" " (p.)	$C_2H_5O.C_6H_4.CO_2H$	166.08	....
9	**Ethyl acetate**	$CH_3CO_2.C_2H_5$	88.06	0.90286^{18}_{4}
10	" " (K.)	$CH_3CO_2.C_2H_5$	88.06	{0.8920– 0.8955^{25}_{25}
11	acetoacetate	$CH_3CO.CH_2.CO_2.C_2H_5$	130.08	1.02443^{20}_{4}
12	aceto-succinate (K.)	$C_2H_3(C_2H_3O):(CO_2C_2H_5)_2$	216.13	1.079^{25}_{25}
13	acetylene	$C_2H_5.C:CH$	54.05	....
14	aconitate (K.)	$C_3H_3(CO_2.C_2H_5)_3$	258.14	1.100^{25}_{25}
15	acrylate	$C_3H_3O_2.C_2H_5$	100.06	0.9393^{0}
16	alcohol	$C_2H_5.OH$	46.05	0.78510^{25}_{4}
17	allyl ether	$C_2H_5.O.CH_2.CH:CH_2$	86.08	....
18	amine	$C_2H_5NH_2$	45.10	0.6994^{8}
19	amyl ketone	$C_2H_5.CO.C_5H_{11}$	128.13	0.852^{0}
20	aniline	$C_2H_5.NH.C_5H_6$	121.13	0.9631^{20}_{4}
21	anthracene	$C_2H_5.C_{14}H_9$	206.12	....
22	anisate	$CH_3O.C_6H_4.CO_2C_2H_5$	180.10	....
23	arsenate	$(C_2H_5)_3AsO_4$	226.12	1.3264^{0} .....
24	arsenite	$(C_2H_5)_3AsO_3$	210.12	1.224^{0}_{4} .....
25	arsine	$C_2H_5AsH_2$	106.06	1.217^{22}
26	benzene	$C_6H_5.C_2H_5$	106.08	0.8736^{14}_{4}
27	benzoate	$C_6H_5.CO_2.C_2H_5$	150.08	1.0509^{15}_{4}
28	" (K.)	$C_6H_5.CO_2.C_2H_5$	150.08	1.054^{25}_{25}
29	benzoic acid (o.)	$C_2H_5.C_6H_4.CO_2H$	150.08	....
30	" " (m.)	$C_2H_5.C_6H_4.CO_2H$	150.08	....
31	" " (p.)	$C_2H_5.C_6H_4.CO_2H$	150.08	....
32	benzoyl-acetate (K.)	$C_6H_5CO.CH_2.CO_2.C_2H_5$	192.10	1.105^{25}_{25}
33	benzyl ether	$C_2H_5.O.CH_2.C_6H_5$	136.10	....
34	" ketone	$C_2H_5.CO.CH_2.C_6H_5$	148.10	$0.998^{17.5}$
35	borate	$(C_2H_5)_3BO_3$	146.12	0.8863^{0}_{4}
36	brom-acetate (K.)	$CH_2Br.CO_2.C_2H_5$	167.02	1.507^{25}_{25}
37	" -butyrate (α) (K.)	$C_2H_5.CHBr.CO_2.C_2H_5$	195.05	1.325^{25}_{25}
38	" -isobutyrate (α) (K.)	$(CH_3)_2CBr.CO_2.C_2H_5$	195.05	1.315^{25}_{25}
39	" -propionate (α) (K.)	$CH_3.CHBr.CO_2C_2H_5$	181.03	1.391^{25}_{25}
40	bromide	C_2H_5Br	109.00	1.4499^{15}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	v. soluble	....	33–4°	$281^{\circ 30}$, $179^{\circ 0}$	needles/al. ..
2	v. soluble	s. soluble	insoluble	126°	329–31°	quadrat. pris.
3	∞ dec.	....	....	....	138°	....
4	s. soluble	46 cc.^{4}	....	−172.1°	$-84.1^{\circ 749}$	....
5	8.11cc.^{22}	∞	∞	−112.6°	34.97°	....
6	s. soluble	....	....	19.4°	....	oil ....
7	s. sol. hot	....	....	137°	sub.	small needles
8	v. v. s. sol.	....	....	195°	....	needles......
9	6	∞	∞	−83.8°	77.4° C.^{754}	....
10	$5.9^{17.5}$	∞	∞	−83.8°	76–7°	colorless.....
11	s. soluble	v. soluble	....	< −80°	181°	....
12	insoluble	∞	∞	....	260–5° dec.	wh.→yel....
13	....	....	....	....	18° C.	....
14	insoluble	∞	∞	....	290–6° dec.	wh.→yel....
15	....	....	....	....	98.5° C.	....
16	∞	....	∞	−112.3°	78.4°	....
17	....	....	....	....	$66\text{–}7^{\circ 743}$	....
18	∞	∞	∞	−83.8°	19–20°	....
19	....	....	....	....	$170^{\circ 738}$	....
20	....	....	....	−80°	206°	....
21	insoluble	soluble	....	60–1°	....	leaflets/al....
22	....	....	....	7°	269–5°	....
23	dec.	....	....	....	235–8°	....
24	dec.	....	....	....	165–6°	....
25	0.00126	....	....	....	36°	....
26	insoluble	∞	∞	....	136.5°	....
27	s. sol. hot	soluble	soluble	−93.2°	211.8° C.	....
28	s. sol. hot	soluble	∞	....	209–12°	faint yellow.
29	v. s. sol.	v. soluble	v. soluble	68°	$259^{\circ 760}$	fine flat need.
30	v. v. sol.	....	....	47°	....	long need./w.
31	sol. hot	v. soluble	v. soluble	112–3°	....	leaflets......
32	insoluble	∞	∞	....	265–70°dec.	wh.→yel....
33	insoluble	∞	∞	....	185°	....
34	....	....	....	....	223–6°	....
35	....	....	....	....	120°	....
36	insoluble	∞	∞	....	158–60°	wh.→yel....
37	insoluble	∞	∞	....	175–9° dec.	wh.→yel....
38	insoluble	∞	∞	....	161–4° dec.	wh.→yel....
39	insoluble	∞	∞	....	159–61°dec.	wh.→yel....
40	0.914^{20}	∞	∞	−115.8°	38.37°	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
	Ethyl			
1	bromide Phg. IV (K.)	C_2H_5Br	109.00	$1.453\text{–}1.457^{15}_{15}$
2	butyl ether	$C_2H_5.O.C_4H_9$	102.12	0.7522^{20}
3	n. butyl ketone	$C_2H_5.CO.C_4H_9$	114.12	....
4	butyrate	$C_3H_7.CO_2.C_2H_5$	116.10	0.8978^{18}
5	caprate	$C_9H_{19}.CO_2.C_2H_5$	200.20	0.862
6	caproate	$C_5H_{11}.CO_2.C_2H_5$	144.13	0.8732^{20}
7	caprylate	$C_7H_{15}.CO_2.C_2H_5$	172.16	0.8730^{16}
8	carbonate	$(C_2H_5)_2CO_3$	118.08	0.9780^{20}
9	chloracetate	$CH_2Cl.CO_2.C_2H_5$	122.51	1.1585^{20}_{4}
10	chloraceto-acetate (K.)	$CH_3CO.CH_2.CO_2.C_2H_5$	164.52	1.179^{25}_{25}
11	chlorcarbonate	$ClCO_2.C_2H_5$	108.59	1.139^{15}
12	chloride	C_2H_5Cl	64.49	0.9214^{0}
13	chlorpropionate (α)(K.)	$CH_3.CHCl.CO_2.C_2H_5$	136.52	1.095^{25}_{25}
14	cinnamate	$C_6H_5.C_2H_2CO_2.C_2H_5$	176.10	1.0546^{15}_{15}
15	" (K.)	$C_6H_5.C_2H_2CO_2.C_2H_5$	176.10	1.049^{25}_{25}
16	collidinedicarbonate	$C_8H_9N(CO_2C_2H_5)_2$	265.20	1.087^{15}
17	cyanacetate (K.)	$CN.CH_2.CO_2.C_2H_5$	113.10	1.059^{25}_{25}
18	cyancarbonate	$CN.CO_2.C_2H_5$	99.04	1.0134^{20}_{4}
19	cyanide	$C_2H_5.CN$	55.08	0.7799^{20}
20	diaceto-acetate	$(CH_3CO)_2CH.CO_2.C_2H_5$	172.10	1.104^{15}
21	diazoacetate	$C_2HN_2O_2.C_2H_5$	114.13	1.083^{24}
22	dichloracetate	$CHCl_2.CO_2.C_2H_5$	156.95	1.2821^{20}_{4}
23	" (K)	$CHCl_2.CO_2.C_2H_5$	156.95	1.276^{25}_{25}
24	diethyl-aceto-acetate(K.	$CH_3CO.C(C_2H_5)_2CO_2C_2H_5$	186.14	0.963^{25}_{25}
25	" -malonate (K.)	$(C_2H_5)_2>C<(CO_2C_2H_5)_2$	216.16	0.982^{25}_{25}
26	dimethyl-malonate (K.)	$(CH_3)_2>C<(CO_2.C_2H_5)_2$	188.13	0.966^{25}_{25}
27	diphenylamine	$C_2H_5N(C_6H_5)_2$	197.16	....
28	disulphide	$(C_2H_5)_2S_2$	122.20	0.9927^{20}_{4}
29	fluoride	C_2H_5F	48.04	1.7
30	formate	$HCO_2.C_2H_5$	74.05	0.9480^{0}_{4}
31	" (K.)	$HCO_2.C_2H_5$	74.05	0.920^{25}_{25}
32	glutaconate	$C_5H_4O_4(C_2H_5)_2$	186.12	1.0499^{20}_{4}
33	glycerate	$C_2H_3(OH)_2.CO_2.C_2H_5$	134.08	1.0909^{15}
34	glyceryl ether (1)	$C_3H_5(OH)_2OC_2H_5$	120.10	....
35	glycol ether	$HOCH_2.CH_2O.C_2H_5$	90.08	0.926^{13}
36	glycollate	$HOCH_2.CO_2.C_2H_5$	104.06	1.0826^{23}
37	heptyl ether	$C_7H_5.O.C_2H_5$	144.16	0.7949^{0}
38	hexyl ether	$C_2H_5.O.C_6H_{13}$	130.15	....
39	hippurate (K.)	$C_6H_5.CO.NHCH_2.CO_2.C_2H_5$	207.14	....
40	hydrazine	$C_2H_5NH.NH_2$	60.14	....

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	s. soluble	∞	∞	−125.5°	38–40°	colorless.....
2	....	....	....	....	91.4°	....
3	....	....	....	....	147–8°^{743}	....
4	s. soluble	soluble	soluble	−93.3°	120.6° C.	....
5	....	....	....	....	244°	....
6	insoluble	soluble	soluble	....	166.6°	....
7	....	....	....	−48°	205.8°	....
8	insoluble	soluble	....	....	125.8° C.	....
9	insoluble	....	....	....	144.5°^{754}	....
10	v. s. sol.	∞	∞	....	196–200°	wh.⟶yel....
11	decomp.	∞	∞	....	94°	....
12	2	∞	∞	−141.6°	19.5°	....
13	v. s. sol.	∞	∞	....	145–9°	colorless.....
14	....	soluble	....	12°	271°	....
15	....	soluble	∞	7.5°	270–1° dec.	yellowish....
16	....	....	....	....	308–10°	thick yel. oil.
17	insoluble	∞	∞	....	205–8°	wh.⟶yel....
18	insoluble	soluble	soluble	....	115–6°	....
19	mod. sol.	∞	....	−103.5°	97.08° C.	....
20	s. soluble	....	....	....	209–11°dec	....
21	s. soluble	∞	∞	−22°	140–1°^{720}	oil.........
22	....	....	....	....	157.7°^{755}	....
23	insoluble	∞	∞	....	156–9°	colorless ....
24	insoluble	∞	∞	....	211–6° dec.	wh.⟶yel....
25	insoluble	∞	∞	....	222–7°	colorless.....
26	insoluble	∞	∞	....	192–6°	colorless.....
27	....	soluble	....	....	295–7°	....
28	v. s. sol.	....	soluble	....	153°^{730} C.	oil.........
29	198 c.c.[14]	v. soluble	....	....	−32°	....
30	11	∞	∞	−78.9°	54.4°	....
31	s. sol. dec.	∞	∞	....	54–5°	colorless.....
32	....	....	....	....	236–7°	....
33	soluble	....	....	....	230–240°	....
34	....	....	....	....	225–30°	....
35	soluble	∞	∞	....	135°	....
36	....	....	....	....	160° C.	....
37	....	....	....	....	166.6°	....
38	....	....	....	....	134–7°	....
39	insoluble	soluble	soluble	60–1°	....	sm. nd. wh..
40	v. soluble	v. soluble	v. soluble	....	99.5°^{709}	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
	Ethyl			
1	hydrocinnamate (K.)	$C_6H_5.CH_2CH_2CO_2.C_2H_5$	178.11	1.012^{25}_{25}
2	hydrocollidine dicarbonate	$C_{10}H_{11}NO_4(C_2H_5)_2$	267.21	....
3	hydroxylamine (α)	$NH_2.O.C_2H_5$	61.10	$0.8827^{7.5}$
4	" (β)	C_2H_5NHOH	61.10	$0.9079^{6.4}_{4}$
5	hypochlorite	C_2H_5ClO	80.49	....
6	iodide	$CH_3.CH_2I$	156.01	1.9492^{15}
7	" (K.)	$CH_3.CH_2I$	156.01	1.94^{15}_{15}
8	iodopropionate (β)(K.)	$CH_2I.CH_2.CO_2.C_2H_5$	227.92	1.666^{25}_{25}
9	isoamyl aceto-acetate (K.)	$C_2H_3O.CH(C_5H_{11})CO_2C_2H_5$	200.16	0.951^{25}_{25}
10	isoamyl ether	$C_2H_5.O.C_5H_{11}$	116.13	0.761^{18}
11	isobutyl ether	$C_2H_5.O.C_4H_9$	102.12	0.7507
12	isobutyrate	$(CH_3)_2CH.CO_2.C_2H_5$	116.10	0.8904^{0}_{4}
13	isobutyl ketone	$C_2H_5.CO.C_4H_9$	114.12	0.815^{17}_{0}
14	isocrotyl ether	$(CH_3)_2C: CHOC_2H_5$	100.10	....
15	isocyanate	$.C_2H_5NCO$	71.08	0.8981
16	isocyanide	$C \vdots N.C_2H_5$	55.08	0.7591^{4}
17	isopropyl-acetoacetate (K.)	$C_2H_3O.CH(C_3H_7).CO_2C_2H_5$	172.13	0.96^{25}_{25}
18	" -malonate (K.)	$(CH_3)_2CH.CH(CO_2.C_2H_5)$	202.14	0.987^{25}_{25}
19	" ether	$C_2H_5.O.CH(CH_3)_2$	88.10	0.7447^{0}
20	" ketone	$C_2H_5.CO.CH(CH_3)_2$	100.10	0.830^{0}_{0}
21	isosuccinate (K.)	$CH_3.CH<(CO_2.C_2H_5)_2$	174.11	1.022^{25}_{25}
22	isovaleriate	$(CH_3)_2CH.CH_2CO_2C_2H_5$	130.12	0.8717^{18}
23	lactate	$C_3H_5O_3.C_2H_5$	118.08	1.0308^{19}
24	laurate	$C_{12}H_{23}O_2.C_2H_5$	228.22	0.867^{19}
25	levulinate (K.)	$CH_3CO.CH_2.CH_2.CO_2.C_2H_5$	144.10	1.011^{25}_{25}
26	malate (K.)	$C_2H_5CO_2.C_2H_3(OH)CO_2C_2H_5$	190.11	1.124^{25}_{25}
27	malonate	$C_3H_2O_4.(C_2H_5)_2$	160.10	1.0610^{15}
28	" (K.)	$C_3H_2O_4.(C_2H_5)_2$	160.10	1.054^{25}_{25}
29	mercaptan	C_2H_5SH	62.11	0.838^{21}_{4}
30	monotartrate	$CO_2H.(CHOH)_2CO_2C_2H_5$	178.08	....
31	mustard oil	C_2H_5NCS	87.14	0.9952^{23}
32	myristate	$C_{14}H_{27}O_2.C_2H_5$	256.26	....
33	naphthaline (α)	$C_{10}H_7.C_2H_5$	156.10	1.0635^{15}_{15}
34	" (β)	$C_{10}H_7.C_2H_5$	156.10	1.0078^{0}
35	naphthyl ether (α)	$C_{10}H_7OC_2H_5$	172.10	1.0579^{25}_{25}

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	insoluble	....	....	....	242–5°	wh → yel....
2	v. v. s. sol.	s. soluble	s. soluble	131°	dec. 315°+	tablets/al....
3	v. soluble	v. soluble	v. soluble	59–60°	sublimes	pearly leaf...
4	∞	∞	∞	....	68°	....
5	....	....	....	....	$36^{\circ 752}$	yellow......
6	0.403^{20}	soluble	soluble	−108.5°	72.34°	....
7	s. soluble	soluble	∞	−118°	71–2°	turns reddish
8	v. s. sol.	∞	∞	....	198–201°	wh. → yel....
9	insoluble	∞	∞	....	230–6° dec.	wh. → yel....
10	insoluble	∞	....	....	112°	....
11	....	....	....	....	78–80°	....
12	s. soluble	∞	∞	....	110–1°	....
13	....	....	....	....	136°	....
14	....	....	....	....	92–4°	....
15	insoluble	....	soluble	....	60°	....
16	mod. sol.	....	soluble	< −66°	78.1°	....
17	v. s. sol.	∞	∞	....	200–5° dec.	wh. → yel...
18	insoluble	∞	∞	....	212–7° dec.	colorless.....
19	soluble	∞	∞	....	54°	....
20	....	v. soluble	....	....	114.5°	....
21	v. s. sol.	∞	∞	....	194–7°	colorless.....
22	insoluble	∞	∞	....	134.3°	....
23	∞	....	....	....	154.5° C.	....
24	....	....	....	−10°	269°, $79^{\circ 0}$	oil..........
25	s. soluble	∞	∞	....	202–5.5°	wh. → yel....
26	soluble	∞	∞	....	248–52° d.	colorless.....
27	....	∞	∞	−49.8° C.	197.7–8.2°C	....
28	....	∞	∞	....	196.5–9.5°	colorless.....
29	1.5	soluble	soluble	−144.4°	$37^{\circ 759}$	....
30	soluble	....	....	90°	....	rhomb. pris..
31	insoluble	soluble	soluble	−5.9° C.	131–2°	....
32	....	s. soluble	s. soluble	10.5–11.5°	295°, $102^{\circ 0}$	....
33	....	....	....	< −14°	258° s. dec.	....
34	....	....	....	−19°	251°	....
35	....	....	....	5.5°	279.8° C.	crystals.....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Ethyl naphthyl ether (β)..	$C_{10}H_7OC_2H_5$	172.10	$1.0615^{\frac{25}{25}}$
2	nitrate	$C_2H_5NO_3$	91.08	1.1159^{15}
3	" (K.)	$C_2H_5NO_3$	91.08	$1.104^{\frac{25}{25}}$
4	nitrite	$C_2H_5NO_2$	75.08	0.900^{15}
5	nitro-benzoate(m.)(K.)	$NO_2.C_6H_4.CO_2.C_2H_5$	195.11	....
6	" cinnamate (o.)	$NO_2C_9H_6O_2.C_2H_5$	221.13	....
7	" " (p.) (K.)	$NO_2C_6H_4.C_2H_2.CO_2.C_2H_5$	221.13	....
8	nitrolic acid	$CH_3C.(NO_2)NOH$	104.11	....
9	orthoacetate	$CH_3C.(OC_2H_5)_3$	162.15	0.94^{22}
10	orthocarbonate	$C(OC_2H_5)_4$	192.16	$0.9197^{\frac{18}{4}}$
11	orthoformate	$HC(OC_2H_5)_3$	148.13	$0.8971^{\frac{19}{4}}$
12	orthosilicate	$Si(OC_2H_5)_4$	208.56	0.933^{20}
13	oxalate	$C_2O_4(C_2H_5)_2$	146.08	1.0786^{23}
14	" (K.)	$C_2O_4(C_2H_5)_2$	146.08	$1.076^{\frac{25}{25}}$
15	oxamate (K.)	$C_2H_5CO_2.CONH_2$	117.10	....
16	oxanilate (K.)	$C_2H_5CO_2.CONHC_2H_5$	193.13	....
17	palmitate	$C_{16}H_{31}O_2.C_2H_5$	284.30	....
18	perchlorate	$C_2H_5ClO_4$	128.49	....
19	phenol (o.)	$C_2H_5.C_6H_4OH$	122.08	1.0371^{0}...
20	phenyl-acetate (K.)	$C_6H_5.CH_2.CO_2.C_2H_5$	164.10	$1.029^{\frac{25}{25}}$
21	phenyl acetylene	$C_6H_5.C⋮C.C_2H_5$	130.08	0.923^{21}
22	phenyl carbinol	$C_6H_5.CH(OH).C_2H_5$	136.10	0.99^{15}
23	phenyl hydrazine (aa.)	$C_6H_5(C_2H_5)N.NH_2$	136.18	1.018^{15}
24	" " (ab.)	$C_6H_5NH.HNC_2H_5$	136.18	1.+
25	phenyl ketone	$C_2H_5.CO.C_6H_5$	134.08	$1.0150^{\frac{15}{15}}$
26	" malonate (K.)	$C_6H_5.CH(CO_2.C_2H_5)_2$	236.13	$1.0945^{\frac{25}{25}}$
27	phenyl sulphone	$C_2H_5.SO_2.C_6H_5$	170.14	1.01^{22}
28	phosphate	$(C_2H_5)_3PO_4$	182.12	1.072^{12}
29	phosphine	$C_2H_5PH_2$	62.06	$<1.$
30	phthalate (o.) (K.)	$C_6H_4(CO_2.C_2H_5)_2$	222.11	$1.126^{\frac{25}{25}}$
31	propargyl ether	$C_2H_5OC_3H_3$	84.06	$0.8326^{\frac{20}{4}}$
32	propiolate	$C_3HO_2.C_2H_5$	98.05	....
33	propionate	$C_2H_5.CO_2.C_2H_5$	102.08	0.8964^{16}
34	" (K.)	$C_2H_5.CO_2.C_2H_5$	102.08	$0.885^{\frac{25}{25}}$
35	propyl carbinol	$C_3H_7.CHOH.C_2H_5$	102.12	0.8188^{20}
36	" ether	$C_2H_5OC_3H_7$	88.10	0.7545^{0}
37	" ketone	$C_2H_5.CO.C_3H_5$	100.10	$0.818^{17.5}$
38	pyridine (2) (α)	$C_2H_5.C_5H_4N$	107.11	0.9371^{17}
39	pyrrol (1)	$C_2H_5.C_4H_4N$	95.11	0.9042^{10}
40	pyroracemate (K.)	$CH_3.CO.CO_2.C_2H_5$	116.06	$1.049^{\frac{25}{25}}$
41	salicylate	$HOC_6H_4.CO_2.C_2H_5$	166.08	$1.1372^{\frac{15}{15}}$

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	....	....	....	33°	282°	cryst. mass.
2	insoluble	soluble	soluble	−112° C.	87.6°	....
3	v. s. sol.	∞	∞	−112°	86–7°	....
4	insoluble	∞	soluble	....	16.4°	....
5	insoluble	v. soluble	v. soluble	53–4°	....	yel. prisms...
6	v. sol. bz.	v. soluble	v. soluble	44°	....	thin rh'b. nd.
7	insoluble	s. soluble	s. soluble	140–1°	....	flat nd. yel...
8	soluble	....	soluble	86–8°	dec.	yel. rhombic.
9	....	....	....	....	142°	....
10	....	....	....	....	158–9°	....
11	....	....	....	....	145.5°	....
12	decomp.	....	....	....	165°	....
13	s. soluble	soluble	soluble	−41°	186.1° C.	....
14	s. sol. dec.	∞	∞	−41°	184–5°	colorless.....
15	soluble	s. soluble	s. soluble	114–5°	....	wh. prisms...
16	v. s. sol.	soluble	soluble	66–7°	....	wh. prisms...
17	....	....	....	24.2°	$185^{\circ 10}$, $122^{\circ 0}$	long flat need.
18	insoluble	soluble	soluble	....	74°	oil..........
19	....	....	....	$<-18°$	206.5–7.5°	....
20	insoluble	∞	∞	....	223–6°	colorless.....
21	....	....	....	....	201–3°	....
22	....	soluble	soluble	....	219–20°	....
23	....	....	....	....	237° C.	oil..........
24	s. soluble	soluble	soluble ..	....	$100–4^{\circ 10}$	oil..........
25	....	....	soluble	21°	218°	....
26	insoluble	v. soluble	∞	....	278–85° d.	wh. → yel....
27	mod. sol. hot	v. soluble	v. soluble	42°	$>300°$	moncl. tab./et
28	decomp.	soluble	soluble	....	215°, $116^{\circ 30}$	....
29	....	....	....	....	25°	....
30	insoluble	∞	∞	....	290–4°	colorless.....
31	s. soluble	∞	∞	....	80°	....
32	....	v. soluble	v. soluble	....	119°	oil..........
33	s. soluble	∞	∞	-72.6°	98.8° C.	....
34	....	∞	∞	....	99–102°	colorless.....
35	....	soluble	....	....	135° C.	....
36	soluble	∞	∞	....	63.6.°	....
37	....	....	....	....	122–4°	....
38	....	....	v. soluble	....	148.65° C.	....
39	insoluble	∞	∞	....	131°	....
40	s. soluble	∞	∞	....	148–53°	wh. → yel....
41	....	∞	∞	1.3° C.	231.5°	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Ethyl salicylate (K.)	$HOC_6H_4.CO_2.C_2H_5$	166.08	1.13^{25}_{25}
2	sebacate (K.)	$C_2H_5CO_2(CH_2)_8CO_2C_2H_5$	258.21	0.988^{25}_{52}
3	selenide	$(C_2H_5)_2Se$	137.28	1.+
4	succinate	$C_4H_4O_4(C_2H_5)_2$	174.12	1.0464^{15}
5	" (K.)	$C_4H_4O_4(C_2H_5)_2$	174.12	1.038^{25}_{25}
6	succinic acid	$CO_2H.C_2H_3(C_2H_5)CO_2H$	146.08	.....
7	succinyl-succinate (K.)	$(CH.CH_2.CO)_2(CO_2C_2H_5)_2$	256.13	.....
8	sulphate	$(C_2H_5)_2SO_4$	154.14	1.1837^{19}
9	sulphide	$(C_2H_5)_2S$	90.14	0.8364^{21}_{4}
10	sulphinic acid	$C_2H_5SO_2H$	94.11	.....
11	sulphite	$(C_2H_5)_2SO_3$	138.14	1.1063^{0}
12	sulphocyanate	$NCS.C_2H_5$	87.15	1.0071^{23}_{4}
13	sulphone	$(C_2H_5)_2SO_2$	122.14	1.357^{20}
14	" chloride	$C_2H_5.SO_2Cl$	128.55	1.357^{22}
15	sulphonic acid	$C_2H_5SO_2OH$	110.11	.....
16	sulphoxamate	$NH_2CSCO_2C_2H_5$	133.15	.....
17	sulphoxide	$(C_2H_5)_2SO$	106.14	.....
18	sulphuric acid	$C_2H_5HSO_4$	126.11	1.316^{16}
19	tartrate (d.)	$C_4H_4O_6(C_2H_5)_2$	206.12	1.2059^{20}
20	telluride	$(C_2H_5)_2Te$	185.68	.....
21	thiocarbonate	$CS(OC_2H_5)_2$	134.14	1.032^{1}
22	thymyl ether	$C_2H_5OC_{10}H_{13}$	178.15	0.9334^{0}
23	toluene (o.)	$C_2H_5.C_6H_4.CH_3$	120.10	0.8731^{16}
24	" (m.)	$C_2H_5.C_6H_4.CH_3$	120.10	0.869^{20}
25	" (p.)	$C_2H_5.C_6H_4.CH_3$	120.10	0.8652^{21}
26	toluate (o.)	$CH_3.C_6H_4CO_2.C_2H_5$	164.10	1.039^{15}_{15}
27	" (m.)	$CH_3.C_6H_4CO_2.C_2H_5$	164.10	.....
28	trichloracetate	$CCl_3.CO_2.C_2H_5$	191.39	1.3826^{20}_{4}
29	valeriate	$C_5H_9O_2.C_2H_5$	130.12	0.8765^{20}
30	vanillate	$C_8H_7O_4.C_2H_5$	196.10	.....
31	urea	$C_2H_5NH.CO.NH_2$	88.14	1.213^{18}
32	Ethylene	$CH_2{:}\ CH_2$	28.03	1.0.6095
33	acetate	$(C_2H_3O_2)_2C_2H_4$	146.08	1.128^{0}
34	bromide	$CH_2Br.CH_2Br$	187.95	2.1901^{11}_{4}
35	" (K.)	$CH_2Br.CH_2Br$	187.95	2.175^{25}_{25}
36	chloride	$CH_2Cl.CH_2Cl$	98.93	1.2808^{0}_{4}
37	" (K.)	$CH_2Cl.CH_2Cl$	98.93	1.254^{25}_{25}
38	diamine	$NH_2CH_2.CH_2NH_2+H_2O$	78.16	0.970^{15}
39	" (K.)	$NH_2CH_2.CH_2NH_2+H_2O$	78.16	0.976^{25}_{25}
40	diphenyl ether	$C_2H_4(OC_6H_5)_2$	214.12	.....
41	glycol	$OHCH_2.CH_2OH$	62.05	.....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	soluble	∞	1.5–2°	230.5–2.5°	wh. → yel. . .
2	insoluble	v. soluble	∞	0–1°	309–12°	colorless.....
3	insoluble	....	....	....	107–8°	....
4	insoluble	∞	∞*	−20.8° C.	216.5° C.	....
5	insoluble	soluble	∞	....	215–6.5°	colorless.....
6	v. soluble	v. soluble	v. soluble	98°	....	fine prisms . .
7	v. s. sol.	s. soluble	s. soluble	127–8°	....	sm. green nd.
8	insoluble	dec. hot	....	−24.5°	208° C. dec.	....
9	insoluble	soluble	soluble	−99.5°	92.2–3° C.	....
10	sol. alkali	....	....	....	....	syrup.......
11	....	soluble	....	....	161.3°	....
12	insoluble	∞	∞	....	146° C.	....
13	15.6^{16}	....	....	70°	248°	rhombic ....
14	dec.	....	....	....	177.5° C.	....
15	deliq.	soluble	sol. alkali	....	....	cryst. mass. .
16	v. sol. hot	v. soluble	v. soluble	63°	....	lemon yel pris
17	v. soluble	....	....	....	decomp.	thick liquid. .
18	v. soluble	soluble	soluble	....	decomp.	syrup.......
19	s. soluble	∞	∞	....	280°	....
20	v. v. s. sol.	....	....	....	137–8°	reddish yel. . .
21	insoluble	v. soluble	v. soluble	....	161–2°	....
22	....	....	....	....	226.9°	....
23	....	....	....	< −17°	158–9°	....
24	insoluble	soluble	soluble	....	158–9°	....
25	insoluble	soluble	soluble	< −20°	161–2°	....
26	....	....	....	....	227° C.	....
27	....	....	....	....	226–8°	....
28	insoluble	∞	∞	....	$167.1°^{755}$	....
29	insoluble	∞	∞	....	144.5°	....
30	....	....	....	44°	291–3°	crystal......
31	v. v. sol.	v. v. sol.	insol. abs.	91°	....	moncl. prisms
32	25.63 c.c.^{0}	359.5 c.c.	soluble	−169°	−103.9°	....
33	14.3	soluble	soluble	....	186–7°	....
34	v. s. sol.	soluble	....	9.53°	131.6°	....
35	v. s. sol.	soluble	∞	9.5–10°	129.5–31.5	colorless to yel
36	0.869^{20}	soluble	....	−36° C.	83.5° C.	....
37	v. s. sol.	soluble	∞	−40°	83–4.5°	colorless.....
38	soluble	....	0.3	10°	116.5°	....
39	∞	∞	v. s. sol.	9°	117–9°	wh. → yel. . .
40	v. s. sol.	s. soluble	v. soluble	98.5°	....	crystals ....
41	soluble	....	1.1	−17.4°	197.37°	....

* Very soluble chloroform ; insoluble ligroene and CS_2.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Ethylene glycol (K.)	$OHCH_2.CH_2OH$	62.05	1.113^{25}_{25}
2	iodide	$CH_2I.CH_2I$	281.97	2.07
3	monoacetate	$OHCH_2.CH_2OC_2H_3O$	102.05	1.+
4	nitrate	$NO_3.CH_2.CH_2.NO_3$	152.11	1.5099^{4}
5	nitrate nitrite	$NO_2.CH_2.CH_2.NO_3$	136.11	1.472
6	nitrite	$NO_2.CH_2.CH_2.NO_2$	120.11	1.2156^{0}
7	oxide	$<(CH_2)_2>O$	44.03	0.8824^{10}
8	Ethylidene bromide	$CH_3.CHBr_2$	187.95	2.1001^{17}
9	chloride	$CH_3.CHCl_2$	98.93	1.1863^{12}_{4}
10	iodide	$CH_3.CHI_2$	281.97	2.84^{0}
11	urea	$CO<(NH)_2>CH.CH_3$	86.13	....
12	Eucalyptol	$C_{10}H_{18}O$	154.15	0.9267^{20}
13	Eugenol (1, 4, 3)	$C_3H_5.C_6H_3(OH)OCH_3$	164.10	1.0696^{15}_{15}
14	methyl ether (K.)	$C_3H_5.C_6H_3(OCH_3)_2$ 1:3:4	178.11	1.035^{25}_{25}
15	Euxanthic acid	$C_{19}H_{18}O_{11}+2H_2O$	458.18	....
16	Euxanthone	$C_{13}H_8O_4$	228.06	....
17	Filixic acid	$C_{14}H_{16}O_5$	264.13	....
18	Flavaniline	$NH_2.C_6H_4.C_9H_5N.CH_3$	234.20	....
19	Flavopurpurin	$C_{14}H_5(OH)_3O_2$	256.06	....
20	Fluor acetic acid	$CH_2F.CO_2H$	78.03	....
21	Fluoran	$C_{20}H_{12}O_3$	300.10	....
22	Fluoranthene	$C_{15}H_{10}$	190.08	....
23	Fluor-benzene	C_6H_5F	96.04	1.0290^{15}_{15}
24	benzoic acid (o.)	$FC_6H_4.CO_2H$	140.04	....
25	" " (m.)	$FC_6H_4.CO_2H$	140.04	....
26	" " (p.)	$FC_6H_4.CO_2H$	140.04	....
27	Fluorene	$(C_6H_4)_2:CH_2$	166.08	....
28	Fluoresceïn	$C_{20}H_{12}O_5$	332.10	....
29	Fluoroform	CHF_3	70.01	2.48–2.53
30	Fluortoluene (o.)	$FC_6H_4CH_3$	100.06	1.0041^{13}
31	" (m.)	$FC_6H_4CH_3$	100.06	0.9972^{13}
32	" (p.)	$FC_6H_4CH_3$	100.06	1.0005^{15}
33	Formic acid	$H.CO_2H$	46.02	1.2448^{0}_{4}
34	" (K.)	$H.CO_2H$	46.02	1.219^{25}_{25}
35	Formaldehyde	$HCOH$	30.02	0.8153^{-20}
36	Formamide	$HCONH_2$	45.07	1.1394^{20}_{4}
37	Formanilid	$HCONHC_6H_5$	121.10	1.1437^{17}_{4}
38	Formyl-diphenylamine (K.)	$CHO.N(C_6H_5)_2$	197.13	....
39	piperidine (K.)	$CHO.NC_5H_{10}$	113.13	1.0235^{25}_{25}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	∞	∞	v. s. sol.	−20°	194–8°	colorless.....
2	s. soluble	soluble	....	81–2°	dec.	pris. or tab...
3	∞	soluble	....	....	182°	....
4	....	soluble	....	*	exp. 114–6°	....
5	....	soluble	....	....	not volatile	oil.........
6	insoluble	soluble	soluble	< −15°	96–8°	....
7	∞	∞	∞	....	$13.5^{0\,746}$	....
8	....	....	....	....	$112.5^{0\,755}$	....
9	0.550^{20}	....	....	−101.5°	59.9° C.	....
10	....	....	....	....	177–9°	....
11	v. v. s. sol.	s. soluble	v. v. s. sol.	154°	dec. 160°	small needles
12	....	....	soluble	−1–3°	176°	....
13	v. s. sol.	∞	∞	....	253.5° C.	oil.........
14	insoluble	∞	∞	....	250–3°	colorless.....
15	s. soluble	mod. sol.	v. soluble	156–8°	dec.	glit. yel. need
16	insoluble	soluble	s. soluble	240° C.	sub. dec.	pale yel. leaf. or need.
17	insoluble	v. v. s. sol.	mod. sol.	184.5°	....	v. sm. leaf./et
18	v. s. sol.	soluble	sol. bz.	97°	dist.	lrg. pris./bz..
19	v. s. sol. hot	v. s. sol.	s. soluble	459° C.	sub. 160° +	yel. need./al.
20	....	....	....	33°	165°	....
21	sol. H_2SO_4	soluble	....	180°	....	flat needles..
22	sol. CS_2	s. soluble	v. soluble	109–10°	$217^{0\,30}$	monoclinic...
23	....	....	....	< −20°	85°	scales.......
24	s. soluble	v. soluble	v. soluble	120°	....	fine need./w..
25	....	....	....	124°	....	leaflets/w....
26	s. soluble	soluble	soluble	182°	....	monocl. pr...
27	v. sol. bz.,	s. soluble	v. soluble	116° C.	295° C.	leaflets/al....
28	sol. alkali	soluble	s. soluble	no m.p.	dec. 290°	cryst. powder
29	s. soluble	500 c.c.	s. sol. chlo.	....	$20^{0\,40}$ at.	....
30	....	....	....	> −80°	114°	....
31	....	....	....	> −80°	115°	....
32	....	....	....	....	116°	....
33	∞	∞	....	8.6°	100.8°	....
34	∞	∞	∞	7.5°	100–1°	....
35	soluble	soluble	....	....	−21°	....
36	∞	∞	s. soluble	−1°	192–5°	....
37	mod. sol.	v. soluble	soluble	46°	$116^{0\,11}$	monocl. pr...
38	insoluble	soluble	soluble	71.5–2.5°	....	tablets......
39	∞	∞	∞	....	218–22°	wh. → yel...

* Explodes by percussion.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Fructose** (d.)	$C_6H_{12}O_6$	180.10	1.555^{0}
2	**Fuchsin**	$C_{20}H_{19}N_3HCl$	337.74	1.220
3	**Fulminic acid**	: C: N.OH	43.05	....
4	**Fulminuric acid**	$C_3H_3N_3O_3$	129.12	....
5	**Fumaric acid**	$CO_2H.CH:CH.CO_2H$	116.03	1.625
6	**Furfural**	$C_4H_3O.COH$	96.03	1.1594^{20}_{4}
7	" (K.)	$C_4H_3O.COH$	96.03	1.158^{25}_{25}
8	**Furfuramide**	$(C_5H_4O)_3N_2$	268.18	....
9	**Furfuran**	C_4H_4O	68.03	0.9444^{15}
10	**Furfuryl alcohol**	$C_4H_3O.CH_2OH$	98.05	1.1351^{20}_{20}
11	**Galactose** (d.)	$C_6H_{12}O_6$	180.10	....
12	**Gallic acid** 3: 4: 5,	$(OH)_3C_6H_2CO_2H + H_2O$	188.07	1.694^{4}
13	**Geraniol**	$C_9H_{15}.CH_2OH$	154.15	0.8812^{16}_{4}
14	**Gluconic acid** (d.)	$OHCH_2(CHOH)_4CO_2H + 2H_2O$	232.14	....
15	**Glucose** (d.)	$C_6H_{12}O_6 + H_2O$	198.12	1.54–1.57
16	**Glucose oxime** (d.)	$C_6H_{12}O_5: NOH$	195.15	....
17	pentacetate (α)	$C_6H_7O_5(C_2H_3O)_5$	390.18	....
18	phenyl hydrazone (α)	$C_6H_{12}O_5N_2HC_6H_5$	270.23	....
19	" " (β)	$C_6H_{12}O_5N_2HC_6H_5$	270.23	....
20	**Glutaconic acid**	$CO_2H.CH_2.CH:CHCO_2H$	130.05	....
21	anhydride	$C_5H_4O_3$	112.03	....
22	**Glutaminic acid** (i.)	$C_3H_5NH_2(CO_2H)_2$	147.11	1.511‡
23	**Glutaric acid**	$CO_2H.(CH_2)_3CO_2H$	132.06	....
24	anhydride	$C_5H_6O_3$	114.02	....
25	**Glyceric acid**	$OHCH_2.CHOH.CO_2H$	106.05	....
26	aldehyde	$OHCH_2.CHOH.CHO$	90.05	....
27	**Glycerine**	$OHCH_2.CHOH.CH_2OH$	92.06	1.2604^{20}_{4}
28	acetates	†	....	....
29	dinitrate	$C_3H_5(OH)(NO_3)_2 + \frac{1}{3}H_2O$	202.28	1.47^{15} dry
30	mononitrate	$CH_2OH.CHOH.CH_2NO_3$	137.10	....
31	trinitrate	$CH_2NO_3.CHNO_3.CH_2NO_3$	227.16	1.6009^{15}
32	trinitrite	$CH_2NO_2.CHNO_2.CH_2NO_2$	179.16	1.291^{10}_{15}
33	**Glyceryl ether**	$C_3H_5: O_3: C_3H_5$	130.08	1.0907^{18}
34	**Glycid**	$C_2H_3O.CH_2OH$	74.05	1.165^{0}
35	**Glycocholic acid**	$C_{26}H_{43}NO_6$	465.39	....
36	**Glycocoll**	$NH_2CH_2CO_2H$	75.08	1.1607
37	**Glycogen**	$(C_6H_{10}O_5)x, x > 100$	162.08	....
38	**Glycol**	$CH_2OH.CH_2OH$	62.05	1.125^{0}

† See mono-, di-, and triacetins. ‡ (d.) 1.538.

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	v. soluble	20	soluble	95°	....	trimetric....
2	s. soluble	soluble	....	....	....	rhomb. tab...
3	....	....	v. soluble	....	....	....
4	soluble	soluble	soluble	....	exp. 145°	needles/al....
5	0.66^{16}	soluble	soluble	286–7°	sub. 200°+	prisms......
6	9^{13}	soluble	soluble	....	161°	bright yel.
7	9^{13}	∞	∞	....	160–2°	→ dark yel.
8	insoluble	v. soluble	v. soluble	117°	250° dec.	thin short
9	insoluble	v. soluble	v. v. sol.	....	$31.4–5^{0756}$	needles
10	∞	v. soluble	v. soluble	....	170°, $84^{\circ 24}$	syrup.......
11	v. soluble	s. soluble	....	170–1°	....	hexag. tab./a
12	0.8^{12}; 33^{100}	22.2^{15}	2.50^{15}	222–40°	dec.	tric. prism...
13	insol.	∞	∞	< –15°	$230^{\circ 760}$	....
14	v. soluble	insoluble	....	....	....	syrup.......
15	81.68^{17}	s. soluble	insoluble	α148° β150°	....	need./abs. al.
16	v. soluble	v. s. sol.	insoluble	137.5°	....	sm. need.
17	v. s. soluble	1.32^{15}	2.13^{15} *	130°	sub. in vac.	fine need./lig.
18	v. soluble	v. sol. hot	v. v. s. sol.	144–5°	....	v. small crys
19	....	more sol. than α	....	115–6°	....	long needles
20	v. soluble	v. soluble	v. soluble	138°	....	prisms/et...
21	sol. Na_2CO_3.	....	soluble	87° [C.	....	flat need./et..
22	1^{16}(d)1.7(i)	s. soluble	insoluble	198°(d)213°	....	rhombic.....
23	63.9^{20}, 111.8^{65}	v. soluble	v. soluble	97.5°	302–4°	moncl. prisms
24	v. s. sol.	....	s. soluble	56–7°	287° C.	thin needles..
25	∞	∞	insoluble	....	....[steam	syrup.......
26	slowly sol.	v. v. s. sol.	v. v. s. sol.	abt. 132°	not vol. in	crystals ....
27	∞	∞	insoluble	17°	290° C.	rhombic.....
28	....	....	....	....	....	....
29	v. soluble	v. soluble	soluble	26°	$145^{\circ 15}$	....
30	v. soluble	v. soluble	s. soluble	....	....	....
31	0.12	25	∞	2.8 & 13.1°	exp. 260°	dimorphous..
32	insoluble	decomp.	soluble	....	150°	yellow.....
33	∞	∞	∞	....	171–3°	....
34	∞	∞	∞	....	161–2° dec	....
35	3.3^{20}	soluble	0.093	152°	....	needles......
36	23.2	insoluble	....	232–6° C.	....	rhomb. pris..
37	v. soluble	0.150%	insoluble	abt. 240°	....	amorph. pow.
38	∞	∞	1.1	–12°	197.37°	sweet ......

* V. sol. et., bz. and acet. ac. ∞ chlo.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Glycol aldehyde**	$CH_2OH.CHO$	60.03	....
2	amide	$CH_2OH.CONH_2$	75.08	....
3	diacetate	$C_2H_3O_2.CH_2.CH_2.C_2H_3O_2$	146.08	1.128^{0}
4	dimethyl ether	$CH_3OCH_2.CH_2OCH_3$	90.08	0.8732^{20}
5	**Glycolic acid**	$OHCH_2.CO_2H$	76.03	....
6	anhydride	$C_4H_6O_5$	134.05	....
7	**Glycolid**	$C_4H_4O_4$	116.04	....
8	**Glycol monoacetate**	$CH_2OH.CH_2O.C_2H_3O$	104.06	....
9	urea	$C_3H_4N_2O_2$	100.11	....
10	**Glyoxal**	$CHO.CHO$	58.02	1.14^{20}
11	**Glyoxylic acid**	$(OH)_2CH.CO_2H$	92.03	....
12	**Glyoxalin**	$C_3H_4N_2$	68.11	....
13	**Glyoxime**	$OHN:CH.CH:NOH$	88.11	....
14	**Guaiacol** (o.)	$OH.C_6H_4.OCH_3$	124.06	$1.1395^{\frac{15}{15}}$
15	**Guanidine**	$NH:C(NH_2)_2$	59.16	....
16	**Guanine**	$C_5H_5N_5O$	151.24	....
17	**Haematoxylin**	$C_{16}H_{14}O_6+3H_2O$	356.16	....
18	**Helicin** (l.)	$C_{13}H_{16}O_7+\frac{3}{4}H_2O$	284.13	....
19	**Hemimelitic acid**	$C_6H_3(CO_2H)_3 1:2:3$	212.05	....
20	**Hemipinic acid**	$(CH_3O)_2C_6H_2(CO_2H)_2$	226.08	....
21	**Heptadecane**	$C_{17}H_{36}$	240.29	$0.7766^{\frac{22}{4}}$
22	**Heptamethylene**	$(CH_2)_7$	98.12	0.8094^{20}
23	**Heptane** (n.)	$CH_3.(CH_2)_5.CH_3$	100.13	$0.7019^{\frac{0}{4}}$
24	"	$(CH_3)_2C(C_2H_5)_2$	100.13	0.7111^{0}
25	"	$HC(C_2H_5)_3$	100.13	0.689^{27}
26	"	$C_2H_5.CH(CH_3).C_3H_7$	100.13	0.7806^{17}
27	**Heptoic acid** (n.)	$CH_3(CH_2)_5CO_2H$	130.12	$0.9212^{\frac{15}{4}}$
28	" " " (K.)	$CH_3(CH_2)_5CO_2H$	130.11	$0.916^{\frac{25}{25}}$
29	anhydride	$(C_6H_{13}CO)_2O$	242.21	0.932^{21}
30	**Heptyl acetate** (n.)	$C_2H_3O_2.C_7H_{15}$	158.15	0.874^{16}
31	alcohol	$CH_3(CH_2)_5.CH_2OH$	116.13	0.830^{16}
32	amine (K.)	$CH_3(CH_2)_5CH_2NH_2$	115.18	$0.770^{\frac{25}{25}}$
33	**Heptylene** (1)	$CH_3(CH_2)_4CH:CH_2$	98.12	0.7026^{19}
34	**Heptyl ether** (n.)	$(C_7H_{15})_2O$	214.24	0.815^{0}
35	formate	$HCO_2.C_7H_{15}$	144.13	0.894^{0}
36	**Hesperidine**	$C_{22}H_{26}O_{12}$	482.21	....
37	**Hexabrom ethane**	$CBr_3.CBr_3$	403.76	....
38	**Hexachlor benzene**	C_6Cl_6	284.70	2.044^{23}
39	ethane	$CCl_3.CCl_3$	236.70	$1.9988^{\frac{29}{4}}$
40	**Hexadecane**	$C_{16}H_{34}$	226.27	$0.7754^{\frac{18}{4}}$
41	**Hexadecyl-acetylene**	$HC:C.(CH_2)_{15}.CH_3$	250.27	0.7983^{26}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	v. soluble	v. sol. hot	s. soluble	95–7°	s. vol. in	plates.......
2	....	v. soluble	s. soluble	120°	....[steam	crystals.....
3	14	soluble	soluble	....	186–7°	....
4	....	....	....	....	83–4°	....
5	∞	∞	∞	78–9°	dec.	rhomb. moncl
6	insoluble	insoluble	insoluble	128–30°	dec.	powder......
7	insoluble	s. soluble	s. soluble	82°: 86–7°	dist. in vac.	leaflets/al ...
8	∞	∞	∞	....	182°	....
9	mod. sol.	....	....	216°	....	needles......
10	v. soluble	soluble	soluble	15°	$50.5°^{760}$	amorphous..
11	v. soluble	....	....	....	with steam	rhomb. prism.
12	v. soluble	v. soluble	s. soluble	88–9°	256°	thick prisms.
13	v. s. sol. hot	insoluble	insoluble	176°	sub.	rhomb.tab./w
14	1.67^{15}	∞	∞	31–3°	205.1° C.	hexag. pris...
15	sol. deliq.	....	....	....	....	crystals.....
16	insoluble	v. s. sol.	v. s. sol.	dec.	....	need. or tab..
17	s. soluble	soluble	soluble	140°	....	tetrag. prisms
18	v. sol.$^{100°}$	soluble	insoluble	175°	....	v. fine need..
19	s. soluble	....	mod. sol.	194–6°	→ anhyd.	needles......
20	v. soluble	mod. sol.	....	177° C.	sublimes	crystals.....
21	....	....	....	22.5°	303°, $81°^{0}$	hexag. tab...
22	....	....	....	....	$117°^{743}$ C.	oil..........
23	insoluble	abt. 100	∞	....	98.4°	....
24	....	soluble	soluble	....	86–7°	....
25	....	soluble	soluble	....	95–8°	....
26	....	....	....	....	91°	....
27	0.241^{15}	soluble	soluble	−10.5°	223–3.5°	....
28	v. s. sol.	∞	∞	....	217.5–21.5	wh. → yel...
29	....	....	....	....	268–71°	....
30	....	....	....	....	191.5°	....
31	soluble	∞	∞	−36.5°	175.8°	....
32	v. s. sol.	∞	∞	....	153–5°	wh. → yel...
33	....	soluble	....	....	98–9°	....
34	....	....	....	....	261.9°	....
35	....	....	....	....	176–7°	....
36	0.02	s. soluble	insoluble	251° dec.	....	v. sm. need...
37	....	s. soluble	s. soluble	....	dec. 210°	rhomb. pris..
38	....	insol. cold	v. s. sol.	229.05° C.	326°	monocl. pris..
39	insoluble	v. soluble	v. soluble	....	185° C.	rhomb.tab./al
40	....	∞	∞	19–20°	291°	pearly leaflets
41	....	....	....	26°	$180°^{15}$	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Hexaethyl** benzene	$C_6(C_2H_5)_6$	246.24	0.8305^{20}_{4}
2	**Hexahydro**-anthracene	$C_{14}H_{16}$	184.13	....
3	-benzoic acid	$C_6H_{11}CO_2H$	128.10	1.0480^{15}_{4}
4	-cumene	$C_3H_7.C_6H_{11}$	126.15	0.787^{20}
5	-cymene (p.)	$CH_3.C_6H_{10}.C_3H_7$	140.16	0.796^{15}
6	-mellitic acid	$C_6H_6(CO_2H)_6$	348.10	....
7	-salicylic acid	$OHC_6H_{10}CO_2H$	144.10	....
8	-toluene	$CH_3.C_6H_{11}$	98.12	0.7641^{20}_{4}
9	-xylene (m.)	$(CH_3)_2C_6H_{10}$	112.13	0.7874^{0}_{4}
10	**Hexahydroxy benzene**	$C_6(OH)_6$	174.10	....
11	**Hexamethyl benzene**	$C_6(CH_3)_6$	162.15	....
12	**Hexane** (n.)	$CH_3(CH_2)_4CH_3$	86.12	0.6603^{20}_{4}
13	"	$(CH_3)_2CH.CH(CH_3)_2$	86.12	0.668^{17}
14	"	$(CH_3CH_2)_2CH.CH_3$	86.12	0.6765^{20}_{4}
15	**Hexenoic acid** $\delta\varepsilon$	$CH_2: CH(CH_2)_3.CO_2H$	114.08	....
16	**Hexenoic** " $\alpha\beta$	$CH_3(CH_2)_2.CH: CH.CO_2H$	114.08	....
17	**Hexenyl** alcohol	$C_6H_{11}OH$	100.10	0.891^{10}
18	ether	$(C_6H_{11})_2O$	182.18	....
19	**Hexoic** aldehyde	$CH_3(CH_2)_4CHO$	100.10	0.8335^{20}
20	**Hexyl** acetate (n.)	$C_2H_3O_2.C_6H_{13}$	144.13	0.8902^{0}
21	acetylene (n.)	$CH_3(CH_2)_5C \vdots CH$	110.12	0.7701°
22	alcohol	$CH_3(CH_2)_4.CH_2OH$	102.12	0.8204^{20}
23	**Hexylene (n.)**	$CH_3(CH_2)_3CH: CH_2$	84.10	0.6825^{20}_{4}
24	glycol 2, 3	$C_3H_7.CHOH.CHOH.CH_3$	118.12	0.9669^{0}
25	**Hexyl** formate	$HCO_2.C_6H_{13}$	130.12	0.898^{0}
26	**Hippuric** acid	$C_6H_5CO.NHCH_2CO_2H$	179.11	1.3711^{31}_{4}
27	**Homo-pyro-catechin**	$1: 3: 4CH_3.C_6H_3(OH)_2$	124.06	....
28	**Hydracrylic** acid	$OHCH_2.CH_2CO_2H$	90.05	....
29	**Hydrastin**	$C_{21}H_{21}NO_6$	383.21	....
30	**Hydrazo**-benzene	$C_6H_5NH.NHC_6H_5$	184.18	1.158^{16}
31	benzoic acid (o.)	$(CO_2H.C_6H_4NH)_2$	272.18	....
32	" " (m.)	$(CO_2H.C_6H_4NH)_2$	272.18	....
33	" " (p.)	$(CO_2H.C_6H_4NH)_2$	272.18	....
34	toluene (o.)	$(CH_3C_6H_4NH)_2$	212.21	....
35	" (m.)	$(CHC_6H_4NH)_2$	212.21	....
36	" (p.)	$(CH_3C_6H_4NH)_2$	212.21	0.957^{15}
37	**Hydrindene** (1, 2)	$C_6H_4: C_2H_4: CH_2$	118.08	0.9645^{15}_{15}
38	**Hydrobenzoïn**	$(C_6H_5.CHOH)_2$	214.12	....
39	**Hydrocarbostyril**	C_9H_9NO	147.11	....
40	**Hydrocinnamic acid**	$C_6H_5.CH_2.CH_2CO_2H$	150.08	1.0711^{49}
41	aldehyde	$C_6H_5(CH_2)_2CHO$	134.08	....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	insoluble	soluble	v. soluble	129°	298° C.	long moncl.pr.
2	v. sol. bz.	v. soluble	v. soluble	63°	290°	leaflets......
3	0.201^{15}	v. soluble	v. soluble	30.5–1°	234–5°	monocl. pris.
4	....	....	....	....	147–50°	....
5	....	....	....	....	171–3°	....
6	v. soluble	v. soluble	s. soluble	dec.	....	crystals.....
7	v. soluble	v. soluble	v. soluble	111°	....	quad. tab. [and need.
8	....	....	....	....	103° C.	
9	....	....	....	....	$119.5^{\circ 751}$	....
10	s. soluble	s. soluble	s. soluble	none	....	long needles.
11	....	0.2	....	164°	264°	rhombic/al ..
12	insoluble	abt. 50^{33}	∞	−93.5°	68.95°	....
13	....	soluble	soluble	....	58°	....
14	....	....	....	....	64°	....
15	s. soluble	....	....	....	202–4°	....
16	s. soluble	....	....	32.7–3.1°	216–7° C.	needles/w.
17	v. soluble	∞	∞	....	137°	....
18	insoluble	....	....	....	116–8°	oil..........
19	....	....	....	....	129° C.	....
20	....	....	....	....	169.2°	....
21	....	....	....	....	131–2°	....
22	s. soluble	∞	∞	....	157° C.	....
23	....	....	....	....	68–70°	....
24	∞	soluble	soluble	....	207°	....
25	....	....	....	....	153.6°	....
26	0.326^{20}	s. soluble	s. soluble	190.25° C.	decom.	rhombic.pris.
27	v. soluble	v. soluble	v. soluble	51°	251–2°	....
28	....	....	....	....	decomp.	syrup.......
29	0.003^{20}	s. soluble	0.507^{20}	132°	....	glit. trimet... prisms
30	insoluble	5^{16}	soluble	131°	decomp.	rhomb.tablets
31	....	soluble	....	205°	....	leaf. or pris.
32	insoluble	s. soluble	sol. alkali	....	....	imperf. cryst.
33	insoluble	s. soluble	sol. KOH	....	....	sm. need./al..
34	....	soluble	soluble	165°	decomp.	leaflets......
35	....	soluble	....	....	....	....
36	....	v. soluble	v. soluble	128°	decomp.	monocl. tab.
37	....	....	....	....	177° C.	oil..........
38	0.25^{15}	soluble	....	138°	300°+	moncl.tab./al.
39	v. v. s. sol.	soluble	soluble	163°	....	glit. pris./al..
40	0.6^{20}	v. soluble	soluble	48.7°	279.8°	{moncl. pris.
41	....	16.7	....	....	$221–4^{\circ 744}$ C.	/al.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Hydrocyanic acid	:C:NH	27.05	0.6969^{18}
2	Hydronapthoquinone (1,2)	$C_{10}H_6(OH)_2$	160.06	....
3	" (1,4)	$C_{10}H_6(OH)_2$	160.06	....
4	Hydroquinone (p.)	$C_6H_4(OH)_2$	110.05	1.326
5	dimethyl ether	$C_6H_4(OCH_3)_2$	138.08	1.0526^{55}_{55}
6	ethyl ether	$OHC_6H_4OC_2H_5$	138.08	....
7	Hydrotropilidene	C_7H_{10}	94.08	0.8929^{0}_{0}
8	Hydroxy-anthraquinone (m.)	C_6H_4: $(CO)_2$: C_6H_3OH	224.06	....
9	-benzalcohol (o.)	$OH.C_6H_4.CH_2OH$	124.06	1.1613^{25}
10	-benzalcohol (m.)	$OH.C_6H_4.CH_2OH$	124.06	....
11	" (p.)	$OH.C_6H_4.CH_2OH$	124.06	....
12	-benzaldehyde (o.)	$OHC_6H_4.CHO$	122.05	1.1589^{21}
13	" (m.)	$OHC_6H_4.CHO$	122.05	....
14	" (p.)	$OHC_6H_4.CHO$	122.05	1.1291^{130}
15	-benzamide (o.)	$OHC_6H_4.CONH_2$	137.10	....
16	" (m.)	$OHC_6H_4.CONH_2$	137.10	....
17	" (p.)	$OHC_6H_4.CONH_2$	137.10	....
18	-benzoic acid (o.)	$OHC_6H_4.CO_2H$	138.05	....
19	" " (m.)	$OHC_6H_4.CO_2H$	138.05	1.473^{4}
20	" " (p.)	$OHC_6H_4.CO_2H$	138.05	1.404^{22}
21	-caprylic acid (α)	$CH_3(CH_2)_5CH(OH)CO_2H$	160.13	....
22	-citric acid	$(OH)_2C_2H_3(CO_2H)_3$	208.06	....
23	-isophthalic acid (2)	$OHC_6H_3(CO_2H)_2 + H_2O$	200.07	....
24	" " (4)	$OHC_6H_3(CO_2H)_2$	182.05	....
25	" " (5)	$OHC_6H_3(CO_2H)_2$	182.05	....
26	-phthalic acid (3)	$OHC_6H_3(CO_2H)_2$	182.05	....
27	" " (4)	$OHC_6H_3(CO_2H)_2$	182.05	....
28	" " (2)	$OHC_6H_3(CO_2H)_2$	182.05	....
29	-purpurin	$C_{14}H_4O_2(OH)_4$	272.06	....
30	-pyridine (α) (2)	$OH.C_5H_4N$	95.08	....
31	" (β) (3)	$OH.C_5H_4N$	95.08	....
32	" (γ) (4)	$OH.C_5H_4N + H_2O$	113.10	....
33	-quinoline (bz. 1) (8)	$C_9H_6N.OH$	145.04	....
34	" (bz. 2) (7)	$C_9H_6N.OH$	145.04	....
35	" (bz. 3) (6)	$C_9H_6N.OH$	145.04	....
36	" (bz. 4) (5)	$C_9H_6N.OH$	145.04	....
37	" (pr. 2) (2)	$C_9H_6N.OH$	145.04	....
38	-toluic acid (1: 2: 3)	$C_6H_3(CO_2H)(CH_3)OH$	152.06	....
39	" " (1: 2: 4)	" $+ \frac{1}{2}H_2O$	161.07	....

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	∞	∞	∞	−10–2°	25.2°	....
2	sol. alkali	....	....	abt. 60°	....	leaflets......
3	mod. sol. hot	soluble	v. soluble	176°	....	monocl. need.
4	5.85^{15}	v. soluble	v. soluble	169°	285°	hex. pris./w..
5	insol.	....	sol. bz.	55–6°	216.6°	large leaf./w.
6	s. soluble	v. soluble	v. soluble	66°	246–7°	thin leaflets..
7	v. s. sol.	soluble	sol. chlo.	....	120–1°....	....
8	v. v. s. sol.	mod. sol.	mod. sol.	302°	sub.	yel. leaf. or need./al.
9	6.7^{22}	v. sol.	v. sol., 1.95 bz. 18°	86°	sub. 100 up	rhomb. tab...
10	v. sol. hot	v. soluble	v. soluble	67°	abt. 300 dec.	needles......
11	soluble	soluble	soluble	124.5–5.5°	....	fine needles..
12	v. s. sol.	∞	∞	−20°	$196.70°^{760}$	oil..........
13	mod. sol. hot	v. soluble	soluble	104°	240° C.	needles/w....
14	s. soluble	v. soluble	v. soluble	115–6°	sub. undec.	needles/w....
15	soluble	....	....	139.9° C.	270° dec.	yellowish leaf.
16	s. soluble	v. soluble	v. soluble	170.5° C.	....	thin leaf./w..
17	s. soluble	v. soluble	s. soluble	162°	....	needles......
18	0.184^{20}	49.63^{15}	23.4^{17}	158° C.	sub.	fine need./w.
19	0.843^{18}	0.01^{25} bz.	9.73^{17}	200°	dist.	rhomb./al...
20	0.492^{21}	v. soluble	9.43^{17}	213–4°	....	monoclinic/w
21	v. s. sol.	v. soluble	v. soluble	69.5°	....	large plates..
22	v. soluble	v. soluble	v. soluble	....	....	syrup.......
23	$0.14; 2.5^{100}$	v. soluble	v. soluble	239°	....	long need./w.
24	0.03^{24}	v. v. sol.	v. soluble	305–6°	....	long needles..
25	$0.06; 18^{100}$	v. soluble	v. soluble	288° C.	....	needles......
26	20^{17}	v. soluble	v. soluble	→anhyd.	....	short pris./w.
27	3^{10}	v. soluble	mod. sol.	181° dec.	....	rosettes/w...
28	s. soluble	v. soluble	mod. sol.	no m.p.	sub.	powder......
29	v. s. sol.	v. s. soluble	sol. acetone	>275°	sub.	br. red./acet.
30	v. soluble	v. soluble	mod. sol.	106–7°	280–1°	fine need./bz.
31	v. soluble	v. soluble	....	129°	dist.	needles .....
32	100^{15}	v. soluble	v. s. sol.	anh. 148.5C.	....	moncl. pris. .
33	v. s. sol.	v. soluble	s. soluble	75–6°	$266.6°C.^{752}$	prisms/dil. al.
34	s. soluble	v. soluble	....	235–8°	sub.	prisms/al.
35	v. s. sol.	s. soluble	v. s. soluble	193°	>360°	small pris./al.
36	sol. alkali	....	s. soluble	224°	....	small leaflets.
37	v. s. sol.	v. soluble	v. soluble	199–200°	sub.	large pris./al.
38	mod. sol.	v. soluble	v. soluble	145–6°	....	glit. need./w.
39	s. soluble	v. soluble	v. soluble	177–8°	....	small need./w

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
	Hydroxy-toluic acid			
1	" " (1:2:5)	$C_6H_3(CO_2H)(CH_3)OH$	152.06	
2	" " (1:2:6)	$C_6H_3(CO_2H)(CH_3)OH$	152.06	
3	" " (1:3:2)	$C_6H_3(CO_2H)(CH_3)OH$	152.06	
4	" " (1:3:4)	" $\frac{1}{2}H_2O$	161.07	
5	" " (1:3:5)	$C_6H_3(CO_2H)(CH_3)OH$	152.06	
6	" " (1:4:2)	$C_6H_3(CO_2H)(CH_3)OH$	152.06	
7	" " (1:4:3)	$C_6H_3(CO_2H)(CH_3)OH$	152.06	
8	" " (1:3:6)	$C_6H_3(CO_2H)(CH_3)OH$	152.06	
9	Hyenic acid	$CH_3(CH_2)_{23}CO_2H$	382.40	
10	Hypogaeic acid	$C_{15}H_{29}.CO_2H$	254.24	
11	Indican	$C_{14}H_{17}O_6N+3H_2O$	349.23	
12	Indigo	$(C_6H_4<{CO \atop NH}>C:)_2$	262.16	1.35
13	dicarbonic acid	$C_{18}H_{10}N_2O_6$	350.16	
14	disulphonic acid	$C_{16}H_8N_2O_2(SO_3H)_2$	422.28	
15	purpurin	$C_{16}H_{10}N_2O_2$	262.16	
16	sulphonic acid	$C_{16}H_9N_2O_2.SO_3H$	342.22	
17	white	$C_{16}H_{12}N_2O_2$	264.18	
18	Indirubin	$C_{16}H_{10}N_2O_2$	262.16	
19	Indol	C_8H_7N	117.10	
20	carbonic acid (pr. 2)	$C_9H_7NO_2$	161.10	
21	Indoxyl	C_8H_6NOH	133.10	
22	Inosite (i.)	$C_6H_{12}O_6+2H_2O$	216.12	1.524^{15}
23	Inulin	$C_{36}H_{62}O_{31}$	990.50	1.539 dry
24	Iodo-acetic acid	$CH_2I.CO_2H$	186.00	
25	-acetylene	CH:CI	151.98	
26	-aniline (o.)	$IC_6H_4NH_2$	219.06	
27	" (m.)	$IC_6H_4NH_2$	219.06	
28	" (p.)	$IC_6H_4NH_2$	219.06	
29	-benzamide (o.)	$IC_6H_4NH_2$	247.06	
30	" (m.)	$IC_6H_4NH_2$	247.06	
31	" (p.)	$IC_6H_4NH_2$	247.06	
32	-benzene	C_6H_5I	204.01	$1.8401\frac{15}{15}$
33	" (K.)	C_6H_5I	204.01	$1.8285\frac{25}{25}$
34	-ethylene	CH_2: CHI	154.00	2.08^0
35	-propionic acid (α)	$CH_3.CHI.CO_2H$	200.01	
36	" " (β)	$CH_2I.CH_2.CO_2H$	200.01	
37	-toluene (o.)	$IC_6H_4.CH_3$	218.03	1.697^{20}
38	" (m.)	$IC_6H_4.CH_3$	218.03	1.698^{20}
39	" (p.)	$IC_6H_4.CH_3$	218.03	

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	s. soluble	v. soluble	v. soluble	183.4°	vol. in steam	needles/w. . .
2	0.14^{25}	v. v. sol.	v. v. sol.	168°	....	needles/w. . .
3	v. sol. hot	sol. chlo..	....	163–4°	vol. in steam	long need./w.
4	sol. hot	v. soluble	v. soluble	172–3°	....	needles/w....
5	mod. sol.	....	....	210°	sub.	tablets/w....
6	v. s. sol.	soluble	....	177° C.	vol. in steam	moncl. pris/al
7	v. s. sol.	v. soluble	soluble	206–7° C.	sub.	long needles .
8	v. s. sol.	v. soluble	v. soluble	151°	vol. in steam	long need./w.
9	insoluble	s. soluble	soluble	77–8°	....	crystals.....
10	insoluble	v. soluble	soluble	33–4°	$230°^{10}$ C.	needles......
11	v. soluble	v. soluble	soluble	176–7° anhy	dec.	brown syrup.
12	insoluble	insoluble	insoluble	390–2°	sub. $156–8°^{0}$	rhomb./anil..
13	sol. H_2SO_4	insoluble	insoluble	....	....	deep blue pow
14	v. soluble	v. soluble	....	....	....	blue amorph.
15	insoluble	soluble	soluble	....	sub.	choc. need. . .
16	soluble	soluble	....	....	dec. 200°	purple......
17	insoluble	soluble	soluble	....	....	white mass. .
18	sol. gl. acet.	mod. sol.	....	....	sub.	rhomb./anil..
19	mod. sol. hot	v. soluble	v. soluble	52°	253–4°	leaflets......
20	mod. sol. hot	v. soluble	v. soluble	203°	....	fine need./w.
21	sol. alkali	....	....	....	not vol.	oil..........
22	10^{12}	v. s. sol.	insoluble	225° C.	319° in vac.	moncl./w....
23	0.001^{15}	v. s. sol.	....	178° dec.	dec. 160°	v. fine cryst..
24	v. soluble	v. soluble	v. soluble	84°	....	rhomb. tab. .
25	mod. sol.	....	....	....	29–32°	....
26	v. s. sol.	v. soluble	....	56.5°	....	fine needles. .
27	insoluble	soluble	....	25–7°	....	leaflets......
28	insoluble	soluble	....	63°	....	need. or pris..
29	soluble	....	....	183.6° C.	....	needles......
30	s. soluble	....	....	186.5° C.	....	....
31	v. s. sol.	....	....	217.6° C.	....	....
32	insoluble	soluble	....	−28.5° C.	$188.4°^{756}$	....
33	insoluble	soluble	∞	−28–9°	186.5–8.5°	usually red . .
34	....	....	....	....	56°	....
35	s. soluble	v. soluble	v. soluble	44.5–5.5°	....	warts or pris.
36	v. s. sol.	v. soluble	v. soluble	82°	....	leaflets......
37	insoluble	....	....	....	211°	....
38	....	....	....	....	204°	....
39	insoluble	....	....	35°	211.5°	leaflets......

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Iodoform**	CHI_3	393.92	4.08^{17}
2	**Iodosobenzene**	C_6H_5IO	220.01	
3	**Iodoxybenzene**	$C_6H_5IO_2$	236.01	
4	**Isatane**	$C_{32}H_{26}N_4O_6$	562.37	
5	**Isatine**	$C_6H_4<\genfrac{}{}{0pt}{}{CO}{N}>COH$	147.08	
6	**Isatine chloride**	C_8H_4ONCl	165.52	
7	**Isatinic acid**	$NH_2.C_6H_4.CO.CO_2H$	165.10	
8	**Isatoic acid, anhydride**	$C_8H_5NO_3$	163.08	
9	**Isatoxime**	$C_8H_6N_2O_2$	162.13	
10	**Isatronic acid**	$C_{17}H_{14}O_2$	250.12	
11	**Isatyd**	$C_{16}H_{12}N_2O_4$	296.18	
12	**Isoamyl-acetate**	$C_2H_3O_2.C_5H_{11}$	130.12	$0.8762^{\frac{15}{4}}$
13	" " (K.)	$C_2H_3O_2.C_5H_{11}$	130.12	$0.867^{\frac{25}{25}}$
14	acetic acid (K.)	$(CH_3)_2CH.(CH_2)_3CO_2H$	130.11	$0.9125^{\frac{25}{25}}$
15	alcohol	$(CH_3)_2CH.(CH_2)_2OH$	88.10	$0.8104^{\frac{20}{4}}$
16	" (K.)	$(CH_3)_2CH.(CH_2)_2OH$	88.10	$0.810–.812^{\frac{25}{25}}$
17	" (sec.)	$(CH_3)_2CH.CH(OH).CH_3$	88.10	$0.819^{\frac{19}{0}}$
18	benzene	$C_6H_5.C_5H_{11}$	148.13	$0.887^{\frac{14}{4}}$
19	benzoate	$C_6H_5CO_2.C_5H_{11}$	192.13	0.9925^{19}
20	bromide	$C_5H_{11}Br$	151.05	1.2058^{22}
21	butyrate	$C_3H_7CO_2.C_5H_{11}$	158.15	$0.8823^{\frac{0}{4}}$
22	carbamate (K.)	$NH_2.CO_2.C_5H_{11}$	131.15	
23	chloracetate (K.)	$CH_2Cl.CO_2.C_5H_{11}$	164.55	$1.041^{\frac{25}{25}}$
24	chlorcarbonate (K.)	$Cl.CO_2.C_5H_{11}$	150.54	$1.024^{\frac{25}{25}}$
25	chloride	$(CH_3)_2CH(CH_2)_2Cl$	106.54	0.8625^{25}
26	cyanide	$(CH_3)_2CH(CH_2)_2CN$	97.13	$0.8075^{\frac{14}{4}}$
27	formate	$HCO_2.C_5H_{11}$	116.10	$0.8944^{\frac{0}{4}}$
28	iodide	$(CH_3)_2CH(CH_2)_2I$	198.06	1.4734^{20}
29	isocyanide	$(CH_3)_2CH(CH_2)_2NC$	97.13	<1
30	isovaleriate	$C_5H_9O_2.C_5H_{11}$	172.16	0.8700^{0}
31	" (K.)	$C_5H_9O_2.C_5H_{11}$	172.16	$0.855^{\frac{25}{25}}$
32	mustard oil	$C_5H_{11}N.CS$	129.19	0.9419^{17}
33	nitrate	$C_5H_{11}NO_3$	133.13	$1.000^{7.5}$
34	nitrite	$C_5H_{11}NO_2$	117.13	0.880^{15}
35	phenol (p.)	$C_5H_{11}.C_6H_4OH$	164.13	
36	phenylketone	$C_5H_{11}.CO.C_6H_5$	176.13	
37	propionate	$C_2H_5CO_2.C_5H_{11}$	144.13	$0.8877^{\frac{0}{4}}$
38	salicylate (K.)	$OH.C_6H_4.CO_2.C_5H_{11}$	208.13	$1.045^{\frac{25}{25}}$
39	sulphide	$(C_5H_{11})_2S$	174.24	$0.843^{\frac{20}{4}}$
40	**Isoanthracene**	$C_{14}H_{10}$	178.08	

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	insoluble	1.3^{18}	soluble	119°	sub.	yel.hexag.tab.
2	mod. sol.	mod. sol.	insoluble	....	explodes	amorphous..
3	v. v. s. sol.	v. sol. bz.	v. sol. chlo.	....	expl. 238°	long need./w.
4	insoluble	soluble	soluble	....	....	warts.......
5	s. soluble	soluble	s. soluble	200–1°	sub.	red. moncl. prisms
6	insoluble	soluble	v. soluble	180° dec.	....	brown need.
7	s. soluble	....	....	....	dec.	crystals.....
8	0.7^{100}	abt. 3^{78}	s. soluble	240° dec.	....	monoclinic .
9	v. s. sol.	soluble	s. KOH	202° dec.	....	long yel.need
10	v. v. s. sol.	v. soluble	v. soluble	156–7°	dec.	leaflets/dil.al.
11	v. v. s. sol.	v. s.sol.	....	237–7.5°	dec.	micro. cryst..
12	s. soluble	∞	∞	....	139°	....
13	v. v. s. sol.	∞	∞	....	138–42°	colorless....
14	v. s. sol.	∞	∞	....	215–21°	colorless.....
15	2.672^{22}	∞	∞	−117.2°	131° C.	....
16	2.5^{25}	∞	∞	....	130–2°	colorless.....
17	....	....	....	....	112.5°	....
18	....	....	....	....	201–2°^{760}	....
19	....	soluble	....	....	261–2°	....
20	insoluble	soluble	....	....	118.6°	....
21	s. soluble	v. soluble	v. soluble	....	178.6°	....
22	s. soluble	soluble	soluble	61–2°	221–3°	leaflets......
23	insoluble	∞	∞	....	189–92°	wh.→yel...
24	v. s. sol. dec	∞	∞	....	151–6°	wh.→yel....
25	insoluble	soluble	....	....	100.9° C.	....
26	....	soluble	....	....	155.48°	....
27	....	soluble	....	....	123.3°	....
28	....	soluble	....	....	148.2° C.	....
29	insoluble	soluble	....	....	137°	....
30	....	soluble	soluble	....	194°^{760}	....
31	v. v. s. sol.	soluble	∞	....	191–3°	colorless.....
32	....	....	....	....	183–4°	....
33	....	soluble	....	....	147–8°	....
34	insoluble	∞	∞	....	99°	....
35	v. s. sol. hot	....	....	92–3°	255°	long need./w.
36	....	....	....	....	241.5–2.5°	....
37	....	soluble	....	....	160.2°	....
38	insoluble	v. soluble	∞	....	268–73°	wh.→yel....
39	....	....	....	....	216°	....
40	....	s. soluble	s. soluble	133.5–4.5°	....	pearly leaflets

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Isoanthraquinone**	$C_{14}H_8O_2$	208.06	....
2	**Isobutane**	$(CH_3)_2CHCH_3$	58.08	....
3	**Isobutyl-acetate**	$C_2H_3O_2.C_4H_9$	116.10	$0.8921^{\frac{0}{4}}$
4	alcohol	$(CH_3)_2CH.CH_2OH$	74.08	$0.8064^{\frac{15}{15}}$
5	"	$(CH_3)_2CH.CH_2OH$	74.08	$0.7995^{\frac{25}{25}}$
6	aldehyde	$(CH_3)_2CH.CHO$	72.06	$0.7938^{\frac{20}{4}}$
7	amine	$(CH_3)_2CHCH_2NH_2$	73.13	0.724^{20}
8	benzene	$C_6H_5.C_4H_9$	134.12	$0.8596^{\frac{20}{0}}$
9	benzoate	$C_6H_5CO.C_4H_9$	178.12	$1.0035^{\frac{15}{15}}$
10	bromide (K.)	$(CH_3)_2CH.CH_2Br$	137.03	$1.261^{\frac{25}{25}}$
11	butyrate	$C_3H_7CO_2.C_4H_9$	144.13	$0.8876^{\frac{0}{4}}$
12	carbamate (K.)	$NH_2.CO_2.C_4H_9$	117.13	....
13	chlor-carbonate (K.)	$Cl.CO_2.C_4H_9$	136.52	$1.040^{\frac{25}{25}}$
14	chloride	$(CH_3)_2CH_2CH_2Cl$	92.52	0.8836^{15}
15	cyanide	$(CH_3)_2CHCH_2CN$	83.11	0.9922^{12}
16	ether	$(C_4H_9)_2O$	146.15	0.7616^{15}
17	formate	$HCO_2.C_4H_9$	102.08	$0.9049^{\frac{0}{4}}$
18	iodide	$(CH_3)_2CH.CH_2I$	184.04	1.6138^{15}
19	isovaleriate (K.)	$(CH_3)_2CH.CH_2CO_2.C_4H_9$	158.14	$0.848^{\frac{25}{25}}$
20	ketone	$(C_4H_9)_2CO$	142.15	0.833^{20}
21	mustard oil	$C_4H_9.NCS$	115.17	$0.943^{\frac{20}{4}}$
22	nitrate (K.)	$(CH_3)_2CH.CH_2.NO_3$	119.11	$1.014^{\frac{25}{25}}$
23	phenylketone	$C_4H_9.CO.C_6H_5$	162.11	0.993^{17}
24	tartrate (K.)	$<[CH(OH).CO_2.C_4H_9]_2$	262.18	....
25	**Isobutyric acid**	$(CH_3)_2CH.CO_2H$	88.06	$0.9487^{\frac{20}{4}}$
26	" " (K.)	$(CH_3)_2CH.CO_2H$	88.06	$0.946^{\frac{25}{25}}$
27	amide (K.)	$(CH_3)_2CH.CONH_2$	87.11	....
28	anhydride	$[(CH_3)_2CHCO]_2O$	158.12	0.9574^{16}
29	**Isocaproic acid**	$(CH_3)_2CH.(CH_2)_2CO_2H$	116.10	0.925^{20}
30	**Isocinchomeronic ac**	$2:5,C_5H_3N(CO_2H)_2+H_2O$	185.10	....
31	**Isocinnamic acid**	$C_6H_5CH:CH.CO_2H$	148.06	....
32	**Isocitric acid**	$C_6H_8O_7+H_2O$	210.08	....
33	**Isocymene** (m.)	$CH_3.C_6H_4.CH(CH_3)_2$	134.12	0.862^{20}
34	**Isocrotonic acid**	$CH_3.CH:HC.CO_2H$	86.05	$1.0312^{\frac{15}{4}}$
35	**Isodulcite**	$CH_3(CHOH)_4CHO+H_2O$	182.12	$1.4708^{\frac{20}{4}}$
36	**Isodurene**	$1:2:3:5C_6H_2(CH_3)_4$	134.12	$0.8961^{\frac{0}{4}}$
37	**Isoeugenol** 1:3:4	$C_{10}H_{12}O_2$	164.10	$1.0907^{\frac{15}{15}}$
38	**Isoheptane**	$(CH_3)_2CH(CH_2)_3CH_3$	100.13	$0.7067^{\frac{0}{4}}$
39	**Isoheptoic acid**	$(CH_3)_2CH(CH_2)_3CO_2H$	130.12	0.9122^{19}
40	**Isohexane**	$(CH_3)_2CH(CH_2)_2CH_3$	86.12	$0.6765^{\frac{0}{0}}$
41	**Isohexylaldehyde**	$(CH_3)_2CH(CH_2)_2CHO$	100.10	....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	....	....	211–2°	....	pale yel. need.
2	....	....	....	....	−11.5°	....
3	s. soluble	∞	∞	....	116.3°	....
4	soluble	∞	∞	−108°	108.0°[762]	vitreous
5	9.55[18]	∞	∞	....	105.5–6.5°	colorless ....
6	9.0	∞	....	....	63–4°	....
7	∞	....	....	....	68–9°	....
8	....	....	....	....	170–0.5° C.	....
9	insoluble	∞	∞	....	241.5° C.	....
10	insoluble	∞	∞	....	89.5–91°	wh.→yel....
11	....	....	....	....	156.9°	....
12	s. soluble	soluble	soluble	63.4°	205–7°	leaflets......
13	v. s. sol. dec	∞	∞	....	127–30°	wh.→yel....
14	....	....	....	....	68.5°	....
15	s. soluble	....	....	....	154°[750]	....
16	soluble	∞	∞	....	122–2.5°	....
17	1.01	....	....	thick −75°	98.5°	....
18	....	....	....	−90.7°	120.4° C.	....
19	insoluble	∞	∞	....	167–70°	colorless.....
20	insoluble	....	....	....	181–2°	....
21	....	....	....	....	162°	....
22	insoluble	∞	∞	....	122–3°	colorless.....
23	....	....	....	....	225–6°	....
24	s. soluble	v. soluble	v. soluble	68–9°	....	wh. scales...
25	20[20]	∞	∞	−79°	155.5°	....
26	∞	∞	∞	−79°	153–4.5°	....
27	v. soluble	v. soluble	s. soluble	128–9°	....	leaflets......
28	insoluble	....	....	....	182.5°	....
29	s. soluble	soluble	soluble	> −18°	207.7° C.	....
30	v. v. s. sol.	v. s. sol.	v. s. sol.	236°	sub.	v. sm. cryst.
31	s. soluble	v. soluble	v. soluble	59°	265° dec.	moncl. pris.
32	v. s. sol.	v. s. sol.	v. s. sol.	→anh. 100°	....	prisms [/lig.
33	....	....	....	< −25°	175–6°	....
34	40	....	....	15.5°	171.9°dec.	long needles..
35	57.11[19]	soluble	54 meth. al.	92–3°	....	large mon./w.
36	....	soluble	....	low	195–7°	....
37	....	soluble	soluble	abt. −10°	267.5° C.	....
38	....	soluble	soluble	....	90.3°	....
39	....	....	....	....	209°	....
40	....	soluble	soluble	....	62°	....
41	s. soluble	soluble	....	....	121°[743]	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Isohexylamine (K.)	$(CH_3)_2CH(CH_2)_2CH_2NH_2$	101.16	0.759^{25}_{25}
2	Isohydrobenzoin	$C_{14}H_{12}(OH)_2$	214.12	......
3	Isohydronaphthoquinone	$C_{10}H_8O_2$	160.06	......
4	Isomalic acid	$CH_3.C(OH)(CO_2H)_2$	134.05	......
5	Isomannid	$C_6H_{10}O_4$	146.08	......
6	Isonicotinic acid	$C_5H_4N.CO_2H$	123.08	......
7	Isopentane	$(CH_3)_2CHCH_2CH_3$	72.10	0.6387^{0}
8	Isophthalic acid (m.)	$C_6H_4(CO_2H)_2$	166.05	......
9	aldehyde (m.)	$C_6H_4(CHO)_2$	134.05	......
10	nitril (m.)	$C_6H_4(CN)_2$	128.11	......
11	Isoprene	$CH_2: CH.C(CH_3): CH_2$	68.06	0.6823^{20}
12	Isopropyl-acetate	$CH_3CO_2.CH(CH_3)_2$	102.08	0.9166^{0}
13	acetylene	$(CH_3)_2CH.C\vdots CH$	68.06	0.6854^{0}
14	alcohol	$CH_3.CH(OH).CH_3$	60.06	0.7909^{15}_{15}
15	" (K.)	$CH_3.CH(OH).CH_3$	60.06	0.796^{25}_{25}
16	amine	$(CH_3)_2CHNH_2$	59.11	0.690^{18}
17	benzoate	$C_6H_5CO_2CH(CH_3)_2$	164.10	1.0172^{15}_{15}
18	benzoic acid (o.)	$(CH_3)_2CH.C_6H_4.CO_2H$	164.10	......
19	bromide (K.)	$(CH_3)_2CH.Br$	123.02	1.310^{25}_{25}
20	chloride (K.)	$(CH_3)_2CH.Cl$	78.51	0.857^{25}_{25}
21	cyanide	$(CH_3)_2CHCN$	69.10	......
22	ether (K.)	$[(CH_3)_2CH]_2O$	102.12	0.7247^{21}
23	ethylene	$(CH_3)_2CH.CH: CH_2$	70.08	......
24	hexyl ketone	$C_3H_7.CO.C_6H_{13}$	156.16	0.841^{17}
25	iodide (K.)	$(CH_3)_2CH.I$	169.91	1.705^{25}_{25}
26	isocyanide	$(CH_3)_2CH.NC$	69.09	0.7596^{0}
27	ketone	$[(CH_3)_2CH]_2CO$	114.12	0.8062^{20}_{4}
28	phenylketone	$(CH_3)_2CH.CO.C_6H_5$	148.10	......
29	pyridine (α)	$(CH_3)_2CH.C_5H_4N$	121.13	0.9342^{0}
30	" (γ)	$(CH_3)_2CH.C_5H_4N$	121.13	0.9439^{0}
31	sulphide	$[(CH_3)_2CH]_2S$	118.18	......
32	Isoquinoline	$(2)C_9H_7N$	129.10	1.0986^{20}_{4}
33	Isosaccharic acid	$<(CH(OH).CH(CO_2H))_2>O$	192.07	......
34	Isosuccinic acid	$CH_3CH(CO_2H)_2$	118.05	1.455
35	Isovaleric acid	$(CH_3)_2CHCH_2CO_2H$	102.08	0.931^{20}
36	" " (K.)	$(CH_3)_2CHCH_2CO_2H$	102.08	0.929^{25}_{25}
37	aldehyde	$(CH_3)_2CH.CH_2CHO$	86.08	0.8040^{15}
38	amide	$(CH_3)_2CH.CH_2.CONH_2$	101.13	......
39	Itaconic acid	$CH_2: C(CO_2H).CH_2CO_2H$	130.05	1.573–1.632
40	Ketene	$H_2C: CO$	42.02	......

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	s. soluble	...	...	...	123–5°	wh.→yel....
2	0.2^{15}	v. soluble	v. soluble	121°	...	mon. pris./w.
3	...	soluble	soluble	unstable	...	small needles
4	v. soluble	v. soluble	v. soluble	abt. 140° d.	dec. 160°	monoclinic...
5	v. soluble	mod. sol.	insoluble	87°	274°	monoclinic...
6	s. soluble	v. v. s. sol.	v. s. sol.	315°	sub. dec.	needles/w ...
7	...	...	...	$<-24°$	30.4°	...
8	0.013^{25}	mod. sol.	...	$<300°$	sub.	long need./w.
9	s. soluble	v. soluble	...	89–90°	...	long needles .
10	s. sol. hot	sol. hot	...	156°	...	fine needles. .
11	...	...	...	...	35.8°	...
12	s. soluble	∞	∞	...	90–3°	...
13	...	...	...	...	$28–9°^{751}$	...
14	∞	∞	∞	−85.8°	82.85° C.	cryst.......
15	∞	∞	∞	...	81–3°	...
16	∞	...	...	...	33–4°	...
17	...	...	...	...	218.5° C.	...
18	sol. hot	...	...	51°	...	prisms/w....
19	insoluble	∞	∞	...	59–60°	colorless.....
20	v. s. sol.	∞	∞	...	35–36.5°	colorless.....
21	...	...	...	...	107–8°	...
22	...	...	...	...	69° C.	...
23	...	...	...	...	21.1–1.3°	...
24	...	...	...	...	200–10°	...
25	insoluble	∞	∞	(−89–91°)	88.5–9.5°	wh.→brown.
26	...	...	...	...	87°	...
27	...	...	...	...	123.7°	...
28	...	...	...	...	217°	...
29	s. soluble	...	...	...	158–9°	...
30	...	...	...	...	177–8°	...
31	insoluble	soluble	soluble	...	$120.5°^{763}$	...
32	hydroscopic	...	...	24.6°	240°	...
33	v. soluble	v. soluble	s. soluble	185°	dec.	rhombic.....
34	44.3^{0}	v. soluble	v. soluble	135° dec.	sub.	prisms......
35	91^{50}, 4.2^{20}	∞	∞	−51°	176.3° C.	...
36	s. soluble	∞	∞	−51°	173–6°	...
37	s. soluble	soluble	soluble	−51°	92.5°	...
38	soluble	soluble	soluble	126–8°	230–2°	...
39	8.3^{20}	25^{15}	s. soluble	161° dec.	not in steam	rhombic.....
40	reacts	∞	soluble	−151° C.	−56° C.	...

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Ketobutyric acid**........	$CH_3CH_2.CO.CO_2H$......	102.05	1.200^{17}
2	**Ketoheptamethylene**.....	$CO(CH_2)_6$..............	112.10	0.9685^{0}
3	**Ketopentamethylene**.....	$CO(CH_2)_4$..............	84.06	0.9416^{21}_{4}
4	**Lactamide**.............	$CH_3.CHOH.CONH_2$.....	89.10	....
5	**Lactic acid** (i.).........	$CH_3.CHOH.CO_2H$.......	90.05	1.2485^{15}_{4}
6	anhydride...........	$C_6H_{10}O_5$..............	162.08	....
7	**Lactid**................	$C_6H_8O_4$...............	144.06	0.8618^{10}_{4}
8	**Lactyl urea**...........	$C_4H_5N_2O_2+H_2O$........	131.14	....
9	**Laevulin**	$C_6H_{10}O_5$ at 100°........	162.08	....
10	**Laevulinic acid**.........	$CH_3.CO.(CH_2)_2CO_2H$....	116.06	1.1367^{25}
11	aldehyde...........	$CH_3.CO.(CH_2)_2CHO$.....	100.06	1.0156^{16}
12	**Lauric acid**............	$C_{11}H_{23}.CO_2H$...........	200.20	0.8642^{60}_{4}
13	aldehyde...........	$C_{11}H_{23}.CHO$............	172.20	....
14	**Lead tetraethyl**........	$Pb(C_2H_5)_4$............	322.96	1.62
15	tetramethyl..........	$Pb(CH_3)_4$............	267.00	2.034^{0}
16	**Lecithin** (protagon).....	$C_{42}H_{84}NPO_9$............	777.71	....
17	**Lepidine**...............	py.4, $C_9H_6N.CH_3$.......	143.11	1.0862^{20} ....
18	**Leucine**..............	$CH_3(CH_2)_3CH(NH_2)CO_2H$	131.15	1.293^{18}
19	**Leucinic acid**..........	$C_3H_7.CH_2.CH(OH).CO_2H$	132.10	....
20	**Leukaniline**...........	$(NH_2C_6H_4)_2CHC_6H_3(NH_2)CH_3$	303.29	....
21	" (o.)........	$CH(C_6H_4NH_2)_3$.........	289.28	....
22	" (p.)........	$CH(C_6H_4NH_2)_3$.........	289.28	....
23	**Leukaurine**............	$CH(C_6H_4OH)_3$..........	292.13	....
24	**Linoleïc acid**...........	$C_{18}H_{32}O_2$..............	252.23	0.9206^{14}
25	**Lophin**...............	$C_{21}H_{16}N_2$..............	296.21	....
26	**Lutidene** (α)...........	$(CH_3)_2C_5H_3N$..........	107.11	0.9467^{0}
27	" (2, 4).........	$(CH_3)_2C_5H_3N$..........	107.11	0.9493^{2}_{4}
28	" (2, 6).........	$(CH_3)_2C_5H_3N$..........	107.11	0.9420^{0}
29	" (3, 4).........	$(CH_3)_2C_5H_3N$..........	107.11	....
30	**Lutidinic acid**..........	$C_5H_3N(CO_2H)_2+H_2O$....	185.10	....
31	**Maleïc acid**	$CO_2H.CH: CH.CO_2H$....	116.03	1.590
32	anhydride...........	$C_4H_2O_3$...............	98.02	0.9339^{19}_{4}
33	**Malic acid** (i.)..........	$CO_2H.CH_2.CHOH.CO_2H$.	134.04	1.601^{20}_{4}
34	" " (l.).........	$CO_2H.CH_2.CHOH.CO_2H$.	134.04	1.595
35	**Malonic acid**...........	$CO_2H.CH_2.CO_2H$........	104.03	....
36	" " (K.)........	$CO_2H.CH_2.CO_2H$........	104.03	....
37	**Maltose**..............	$C_{12}H_{22}O_{11}+H_2O$.........	360.19	1.540^{17}
38	**Mandelic acid** (i).......	$C_6H_5.CHOH.CO_2H$......	152.06	1.361^{4}
39	**Mannid**...............	$C_6H_{10}O_4$..............	146.08	....
40	**Mannite** (d.)...........	$CH_2OH(CHOH)_4CH_2OH$	182.12	1.521^{13}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	...	...	...	...	$78^{\circ 25}$	oil...
2	s. soluble	v. soluble	soluble	...	178.5–9.5°C	oil...
3	...	...	...	...	130–0.5° C.	...
4	v. soluble	v. soluble	...	74°	...	crystals...
5	∞	∞	∞	18° (d) 25°	$83^{\circ 1}$, $119^{\circ 12}$	syrup...
6	v. s. sol.	v. soluble	v. soluble	dec. 250–60	...	amorphous..
7	v. s. sol.	v. s. sol.	...	128°	255°	moncl.tab./al
8	v. soluble	v. soluble	v. v. s. sol.	anhy. 145°	...	rhomb. prism
9	deliq. ∞	10^{22} 84%	insoluble	174°	...	amorphous..
10	∞	v. soluble	v. soluble	32.5–3°	250–3° C.	leaflets...
11	∞	∞	∞	< −21°	186–8° dec.	...
12	insoluble	soluble	soluble	43.6°	$225^{\circ 100}$	needles/al....
13	...	...	...	44.5°	$184\text{–}5^{\circ 100}$	leaflets...
14	insoluble	...	...	...	200°	...
15	...	...	...	...	110°	...
16	insoluble	soluble	soluble	...	dec.	waxy...
17	insoluble	∞	∞	< 0°	261–3°	...
18	2.2^{18}	0.06^{17}	...	sub. 170°	dec.	leaflets...
19	soluble	v. soluble	v. soluble	78°	sub. 100° +	pris. or need..
20	s. sol. hot	v. soluble	s. soluble	100°	...	sm. cryst./w.
21	...	soluble	...	165°	...	brown cryst.
22	...	soluble	...	148°	...	leaflets [/al.
23	s. soluble	v. soluble	sol. acet.	...	...	white pris.
24	insoluble	∞	∞	< −18°	...	yellow oil....
25	insoluble	0.88^{21}	0.32^{20}	275°	...	needles...
26	25; less hot	...	...	...	156°	...
27	20; less hot	...	...	...	157°	...
28	∞ cold: less	...	...	...	142–3°	...
29	...... [hot	...	...	...	163.5–4.5°	...
30	mod. sol.	soluble	insoluble	239–40°	...	tab. or leaf...
31	50^{10}	soluble	soluble	130°	dec. 135°	moncl. prisms
32	...	...	...	60°	202° C.	trimetric....
33	v. soluble	v. soluble	v. soluble	130–1°	...	...
34	deliq.	s. soluble	s. soluble	100°	decomp.	needles...
35	73.5^{20}	soluble	8.0^{15}	132°	decomp.	triclinic...
36	139.37^{15}	soluble	soluble	132–3° dec	...	triclin. leaf...
37	soluble	s. soluble	...	...	...	fine needles..
38	15.95^{20}	soluble	soluble	118.1°	dec.	large rhombic
39	v. soluble	v. soluble	...	...	297–317°	syrup...
40	15.6^{18}	0.07^{14}	insoluble	169.0° C.	$290\text{–}5^{\circ 3\text{–}3.5}$	rhombic pris.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Mannite hexanitrate**	$[CH_2NO_3(CHNO_3)_2]_2$	452.30	1.604^{0}
2	**Mannoheptite**	$C_7H_{16}O_7$	212.13	
3	**Mannoheptose** (d.)	$C_6H_7(OH)_6CHO$	210.12	
4	**Mannose** (d.)	$C_6H_{12}O$	180.10	
5	**Margaric acid**	$C_{16}H_{33}CO_2H$	270.27	
6	**Meconic acid**	$OHC_5HO_2(CO_2H)_2+3H_2O$	254.08	
7	**Meconine**	$C_{10}H_{10}O_4$	194.08	
8	**Melam**	$C_6H_9N_{11}$	235.51	
9	**Melamine**	$(CN.NH_2)_3$	126.29	
10	**Melene**	$C_{30}H_{60}$	420.48	0.89
11	**Melissic acid**	$C_{29}H_{59}CO_2H$	452.48	
12	**Mellitic**	$C_6(CO_2H)_6$	342.05	
13	**Menthol**	$C_{10}H_{19}OH$	156.16	0.890^{15}
14	**Menthon** (l.)	$C_{10}H_{18}O$	154.15	0.8972^{20}
15	**Mercuric cyanide**	$Hg(CN)_2$	252.08	4.0026^{22}
16	mercaptide	$(C_2H_5S)_2Hg$	322.20	
17	**Mercuric ethyl**	$Hg(C_2H_5)_2$	258.08	2.444
18	fulminate	$C_2N_2HgO_2+\frac{1}{2}H_2O$	293.09	44.42 anhy.
19	methyl	$Hg(CH_3)_2$	230.05	3.069
20	naphthyl (α)	$Hg(C_{10}H_7)_2$	454.12	1.929
21	phenyl	$Hg(C_6H_5)_2$	354.08	2.318
22	**Mesaconic acid**	$CH_3(CO_2H)C: CHCO_2H$	130.05	
23	**Mesitol** 1: 3: 5: 2	$(CH_3)_3C_6H_2OH$	136.10	
24	**Mesitylene** 1: 3: 5	$C_6H_3(CH_3)_3$	120.10	0.8694^{10}_{4}
25	**Mesitylinic acid** 1: 3: 5	$(CH_3)_2C_6H_3CO_2H$	150.08	
26	**Mesityl oxide**	$(CH_3)_2C: CHCOCH_3$	98.08	0.8568^{18}
27	**Mesotartaric acid**	$(HO)_2C_2H_2(CO_2H)_2+H_2O$	168.06	1.666
28	**Mesoxalic acid**	$(OH)_2C(CO_2H)_2$	136.03	
29	**Metaldehyde**	$(C_2H_4O)_4$	176.15	
30	**Metastyrene**	$(C_8H_8)_x$	104.06	1.05413
31	**Methane**	CH_4	16.03	0.5542^{0} liq.
32	**Methoxy-benzamide** (o.)	$CH_3O.C_6H_4CO.NH_2$	151.11	
33	" (p.)	$CH_3O.C_6H_4CO.NH_2$	151.11	
34	benzoic acid (o.)	$CH_3O.C_6H_4CO_2H$	152.06	1.180^{15}
35	" " (m.)	$CH_3O.C_6H_4CO_2H$	152.06	
36	**Methyl-acetanilid**	$C_2H_3O.N(CH_3)C_6H_5$	149.13	
37	acetate	$CH_3CO_2.CH_3$	74.05	0.9410^{14}_{4}
38	aceto-acetate (K.)	$CH_3CO.CH_2CO_2CH_3$	116.06	1.073^{25}_{25}
39	aceto-acetic ether	$CH_3COCH(CH_3)CO_2C_2H_5$	144.10	1.009^{6}
40	acrylate	$C_3H_3O_2.CH_3$	86.05	0.973^{0}

* Sol. CS_2, s. sol. bz. † V. sol. CS_2, chlo., and bz.

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	insoluble	2.9^{13}	4^{9}	112–3°	exp. 120°	needles......
2	6.3^{14}	v. s. sol.	....	188° C.	....	small needles
3	v. soluble	s. soluble	....	134–5° C.	....	v. fine need.
4	248^{17}	$0.4^{17.5}$ abs	insoluble	132–3° C.	....	rhombic/al..
5	insoluble	s. soluble	v. soluble	59.9°	$227°^{100}$	crystals.....
6	s. sol.; 25^{100}	s. soluble	s. soluble	....	....	rhomb. tab..
7	$0.14;4.5^{100}$	....	....	102–2.5°	sub.	glit. needles..
8	insoluble	sol. KOH	....	....	....	orange powd.
9	s. soluble	s. soluble	insoluble	....	....	monoclinic...
10	....	$0.13; 3.6^{78}$	abs.]......	62°	370–80°	crystals ....
11	insoluble	v. s. sol.	v. s. sol.	91°	....	silky scales..
12	v. v. sol.	soluble	sol. H_2SO_4	286–8°	dec.	fine silky nee.
13	v. s. sol.	soluble	soluble	42.5°	211–3°	trimorphous.
14	insoluble	∞	∞ CS_2 & bz.	....	206.3° C.	....
15	12.5^{15}	10.1^{17}	44.2^{19} wood al.	dec. 320–400°	....	quad. prisms.
16	....	v. s. sol; 8^{78}	....	76–7°	dec.	leaflets/al....
17	insoluble	s. soluble	soluble	....	159°	....
18	0.071^{12}	s. sol. hot	....	exp. 180°	....	needles/w ...
19	insoluble	....	....	....	96°	....
20	insoluble	s. sol. hot	s. soluble *	187–8°	dist. dec.	leaf./bz......
21	insoluble	mod.sol.hot	†	125–6°	>306° dec	rhomb. pris.
22	2.7^{18}	39	‡ soluble	202°	sub.	need./w.or al.
23	insoluble	v. soluble	v. soluble	68–9°	219.5° C.	crystals
24	insoluble	soluble	soluble	−57.5°	164.5°	....
25	v. s. sol.	v. soluble	....	166°	sub.	moncl./al....
26	soluble	∞	....	....	128.39°	....
27	120^{15}	....	....	140–3°	....	rectang. tab..
28	v. soluble	mod. sol.	s. soluble	119–20°	....	needles......
29	insoluble	1.8^{70}	0.5^{35}	....	sub. 150°	tetragonal ...
30	insoluble	insoluble	v. v. s. sol.	dec.	....	vitreous.....
31	5.45 cc.^{0}	52.2 cc.	soluble	−184°	$-160°^{760}$	....
32	soluble	....	....	129.0° C.	....	leaflets/w....
33	s. soluble	....	....	162–3°	....	....
34	0.5^{30}	....	....	98.5°	200°+	moncl.tab./w.
35	s. soluble	v. soluble	v. soluble	106–7°	sub.	long need./w.
36	mod. sol.	soluble	....	102–4°	$253°^{712}$ C.	prisms./al. ..
37	33^{22} [hot	∞	∞	−98.7°	57.5°	....
38	v. s. sol.	∞	∞	....	169–73° dec	wh.→yel.
39	....	....	....	....	186.8°	....
40	....	....	....	....	80.3° C.	....

‡ Very soluble chloroform, carbon disulphide, and ligroene.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Methyl-acrylic acid**	$CH_2: C.(CH_3)CO_2H$	86.05	1.0153^{20}_{4}
2	**Methylal**	$HCH(OCH_3)_2$	76.06	0.8621^{18}_{4}
3	" (K.)	$HCH(OCH_3)_2$	76.06	0.855^{25}_{25}
4	**Methyl** alcohol	CH_3OH	32.03	0.7913^{20}_{4}
5	" " (K.)	CH_3OH .... $[(OH)_2$	32.03	0.789^{25}_{25}
6	alizarine	$C_6H_4(CO)_2C_6H(CH_3)$	254.08	....
7	allene	$CH_2: C: CHCH_3$	54.05	....
8	allyl carbinol	$CH_2: CH.CH_2.CH(OH).$	86.08	0.834^{20}_{0}
9	" ether	$CH_3OC_3H_5$ .... $[CH_3$	72.06	0.77^{11}
10	amine	CH_3NH_2	31.08	0.699^{-11}
11	" (K.)	CH_3NH_2	31.08	$0.699\frac{-10.8}{15}$
12	amyl-acetylene (n.)	$CH_3(CH_2)_4C \vdots C.CH_3$	110.12	....
13	amyl ketone	$CH_3.CO.C_5H_{11}$	114.12	0.8346^{0}
14	aniline	$CH_3NHC_6H_5$	107.11	$.09912^{15}_{15}$
15	" (K.)	$CH_3NHC_6H_5$	107.11	0.9855^{25}_{25}
16	anthracene (α)	$C_6H_4: (CH_2)_2: C_6H_3.CH_3$	192.10	....
17	" (β)	$C_6H_4: (CH_2)_2: C_6H_3.CH_3$	192.10	....
18	anthraquinone (2)	$CH_3.C_6H_3(CO)_2C_6H_4$	222.08	....
19	arsenic acid	$CH_3.AsO(OH)_2$	140.04	....
20	arsenic dichloride	CH_3AsCl_2	160.93	....
21	arsenious oxide	CH_3AsO	106.03	....
22	arsine	CH_3AsH_2	92.04	....
23	benzoate	$C_6H_5CO_2.CH_3$	136.06	1.0937^{15}_{4}
24	benzoyl-acetate (K.)	$C_6H_5CO.CH_2.CO_2.CH_3$	178.08	1.156^{25}_{25}
25	benzyl ketone	$CH_3.CO.CH_2.C_6H_5$	134.08	1.010^{3}
26	borate	$(CH_3)_3BO_3$	104.07	0.940^{0}
27	bromide	CH_3Br	94.99	1.732^{0}
28	butyl carbinol	$CH_3.CH(OH)C_4H_9$	102.12	0.8327^{0}
29	" ether	$CH_3.O.C_4H_9$	88.10	0.7635^{0}
30	" ketone	$CH_3.CO.C_4H_9$	100.10	0.830^{0}
31	butyrate	$C_3H_7CO_2.CH_3$	102.08	0.9058^{13}_{4}
32	butyrone	$C_8H_{16}O$	128.13	0.827^{16}
33	caprate	$C_9H_{19}CO_2.CH_3$	186.18	....
34	caproate	$C_5H_{11}CO_2.CH_3$	130.12	0.9039^{0}
35	caprylate	$C_7H_{18}CO_2.CH_3$	158.15	0.8942^{0}
36	carbamate (K.)	$NH_2.CO_2.CH_3$	75.08	....
37	chloracetate (K.)	$ClCH_2.CO_2.CH_3$	108.49	1.231^{25}_{25}
38	chlorcarbonate (K.)	$Cl.CO_2.CH_3$	94.47	1.218^{25}_{25}
39	chloride	CH_3Cl	50.48	0.9197^{18}
40	cinnamate	$C_6H_5CH: CH.CO_2.CH_3$	162.08	1.0415^{36}_{0}
41	α-crotonate	$C_3H_5CO_2CH_3$	100.06	0.9806^{4}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	mod. sol.	....	....	16°	162–3°;79°[6]	long prisms..
2	....	....	....	....	45.5°	....
3	28.5	∞	∞	....	41–3°	....
4	∞	∞	∞	−97.8°	66.78°	....
5	∞	∞	∞	−95°	65.7–66.3°	....
6	sol. acetone	soluble	soluble	250–2°	sub. 200°	orange need.
7	....	....	....	....	18–19°	....
8	12.5	....	....	....	115–6°[750]	....
9	....	....	....	....	46°	....
10	1150 cc.[12.5]	sol.	....	....	−6–6.5°	....
11	v. soluble	∞	soluble	....	−6–5.5°	....
12	....	....	....	....	133–4°	....
13	....	....	....	....	151–2°	....
14	....	....	soluble	−80°	198.8°	....
15	s. soluble	soluble	∞	....	193–4°	yellow ......
16	sol. bz.	sol. CS_2	....	199–200°	....	leaflets/al....
17	sol. bz.	s. soluble	s. soluble	207°	....	wh. scales ...
18	v. v. sol. bz.	v. s. sol.	soluble	177°	sub.	wh't needles .
19	soluble	soluble	....	....	....	large leaf./al.
20	....	....	....	....	133°	....
21	....	....	sol. bz.	95°	dec.	warts/CS_2...
22	0.00085	∞	∞	....	....	....
23	insoluble	∞	∞	....	198.6° C.	....
24	insoluble	∞	∞	....	260–5° dec.	wh.→yel....
25	....	soluble	....	27°	215°	....
26	....	....	....	....	65°	....
27	s. soluble	soluble	....	< −84°	4.5°[758]	....
28	v. s. sol.	soluble	....	....	136°	....
29	....	....	....	....	70.3°	....
30	....	....	....	....	127.37°	....
31	....	∞	∞	....	102–3°	....
32	....	....	....	....	180°	....
33	....	....	....	....	223.5°	....
34	....	....	....	....	149.6°	....
35	....	....	....	−40°	192.9°	....
36	v. soluble	v. soluble	soluble	54–5°	177–8°	flat prisms...
37	v. s. sol.	∞	∞	....	130–2°	colorless.....
38	decomp.	∞	∞	....	72–5°	colorless.....
39	400 c.c.	3500 c.c.	....	−103.6°	−23.73°	....
40	....	....	soluble	36°	259.6°	....
41	....	....	....	....	120.7°	....

Number.	Name.	Formula	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
	Methyl			
1	cyan-acetate (K.)	$CN.CH_2.CO_2.CH_3$	99.08	1.128^{25}_{25}
2	cyanide	CH_3CN	41.03	0.7784^{23}
3	" (K.)	CH_3CN	41.03	0.784^{25}_{25}
4	diethyl carbinol	$(C_2H_5)_2.C(OH).CH_3$	102.12	0.8237^{20}
5	dimethyl-aceto-acetate (K.)	$CH_3CO.C(CH_3)_2CO_2CH_3$	144.10	0.999^{25}_{25}
6	ether	$(CH_3)_2O$	46.05	1.617
7	ethyl acetic acid	$CH_3(C_2H_5)CH.CO_2H$	102.08	0.938^{20}_{20}
8	" acetone	$CH_3CO.CH(CH_3)C_2H_5$	100.10	0.818^{14}_{4}
9	" carbonate	$CH_3.CO_3.C_2H_5$	104.06	1.002^{27}
10	" ether	$CH_3.O.C_2H_5$	60.06	0.7252^{0}
11	" ketone	$CH_3.CO.C_2H_5$	72.06	0.8045^{20}
12	" " (K.)	$CH_3.CO.C_2H_5$	72.06	0.8045^{25}_{25}
13	" ketoxime (K.)	$CH_3.C(NOH).C_2H_5$	87.11	0.921^{25}_{25}
14	" -malonic ac. (K.)	$CH_3C(C_2H_5) < (CO_2H)_2$	146.08	....
15	" oxalate	$CH_3O.C_2O_2.OC_2H_5$	132.06	1.1556^{0}
16	" succinate	$C_4H_4O_4(CH_3)C_2H_5$	160.10	1.0925^{0}
17	" sulphide	$CH_3.S.C_2H_5$	76.12	0.8369^{21}_{4}
18	fluoride	CH_3F	34.03	....
19	formate	$HCO_2.CH_3$	60.03	0.9860^{11}_{4}
20	furfurol (2, 5)	$CH_3.C_4H_2O.CHO$	110.05	1.1087^{18}
21	glycerate (K.)	$CH_2OH.CHOH.CO_2CH_3$	120.06	1.270^{25}_{25}
22	glycolate (K.)	$OHCH_2.CO_2.CH_3$	90.05	1.1677^{18}
23	hepten(2)ol(6) (2)	$C_8H_{15}.OH$	128.13	0.8545^{20}
24	hepten(2)one(6) (2)	$C_7H_{14}CO$	126.12	0.8602^{20}
25	heptyl ether	$CH_3.O.C_7H_{15}$	130.15	0.7953^{0}
26	hexyl ketone	$CH_3.CO.C_6H_{13}$	128.13	0.8201^{16}_{4}
27	hydrazine	$NH_2.NHCH_3$	46.13	....
28	hypochlorite	CH_3ClO	66.48	....
29	indol (pr. 2)	C_9H_9N	131.11	....
30	iodide	CH_3I	142.00	2.2852^{15}
31	" (K.)	CH_3I	142.00	2.27^{25}_{25}
32	isoamyl ether	$CH_3.O.C_5H_{11}$	102.12	0.6871^{91}_{4}
33	" ketone	$CH_3.CO.C_5H_{11}$	114.12	0.818^{17}
34	isobutyl ketone	$CH_3.CO.C_4H_9$	100.10	0.803^{19}_{0}
35	isobutyrate	$(CH_3)_2CH.CO_2.CH_3$	102.08	0.9113^{0}_{4}
36	isocyanide	$CH_3.NC$	41.07	0.7557^{4}
37	isohexyl ketone	$CH_3CO(CH_2)_3CH(CH_3)_2$	128.13	0.817^{19}
38	isopropyl ketone	$CH_3COCH(CH_3)_2$	86.08	0.8045^{19}
39	isosuccinate	$C_5H_7O_2.CH_3$	146.08	1.107^{15}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	insoluble	∞	∞	....	202–5°	wh.⟶yel....
2	∞	∞	sol. bz.	−44.4° C.	81.54°	....
3	∞	∞	∞	−41°	80–2°	colorless.....
4	....	soluble	....	< −38°	123° C.	....
5	v. s. sol.	∞	∞	....	170–4°	wh.⟶yel. ...
6	3700 c.c.	∞	∞	....	−23.65°	....
7	....	....	....	< −80°	177° C.	....
8	....	....	....	....	118° C.	....
9	....	....	....	−14.5°	109.2° C.	....
10	soluble	∞	∞	....	10.8°	....
11	soluble	....	soluble	−85.9°	79.7°	....
12	....	....	....	....	79.5–81.5°	colorless ....
13	soluble	∞	∞	....	150–3°	colorless.....
14	v. soluble	v. soluble	v. soluble	116.5–7.5°	....	sm. wh. pris.
15	....	....	....	....	173.7° C.	....
16	....	....	....	< −20°	208.2° C.	....
17	....	....	∞	−104.8°	66.9°	....
18	166 c.c.[15]	....	....	....	$-78^{\circ 742}$	....
19	soluble	∞	....	−101.2°	32.3°	....
20	3.3	v. soluble	....	....	187° C.	oil.........
21	∞	∞	v. s. sol.	....	239–44°	wh.⟶yel....
22	....	....	....	....	151.2° C.	....
23	....	....	v. soluble	....	174–6°	....
24	....	....	....	....	173–4°	....
25	....	∞	∞	....	149.8°	....
26	....	....	....	−16°	172.92°	....
27	soluble....	∞	∞	....	$87^{\circ 745}$	....
28	....	....	....	....	$12^{\circ 726}$	....
29	....	v. soluble	v. soluble	59–60°	$272^{\circ 750}$	need. or leaf..
30	s. soluble	∞	....	−64.4°	44.5° C.	....
31	0.8 c.c.	soluble	∞	....	42–3°	becomes red.
32	....	....	....	....	91°	....
33	....	....	....	....	144° C.	....
34	insoluble	∞	∞ ; ∞ bz.	....	$119^{\circ 765}$	....
35	s. soluble	∞	∞	....	92.3°	....
36	10[15]	2.9	....	−45°	59.6°	....
37	....	....	....	....	170–1°	....
38	....	....	....	....	95°	....
39	....	....	....	....	179°	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Methyl** isosuccinate (K.).	$CH_3.CH<(CO_2.CH_3)_2$....	160.09	$1.028^{\frac{25}{25}}$
2	isovaleriate..........	$C_5H_9O_2.CH_3$............	116.10	$0.9001^{\frac{0}{4}}$
3	lactate..............	$C_3H_5O_3.CH_3$...........	104.06	1.118^{0}
4	malate (K.).........	$CH_3CO_2.CHOH.CH_2.CO_2$ CH_3	162.08	$1.225^{\frac{25}{25}}$
5	malic acid (β)........	$CO_2H.CH(CH_3).CHOH.$	148.06	....
6	malonate............	$C_3H_2O_4(CH_3)_2$.... $[CO_2H$	132.06	1.1603^{15}
7	mandelate...........	$C_6H_5.CH(OH).CO_2.CH_3$..	166.08	....
8	mercaptan...........	CH_3SH...............	48.09	<1
9	mustard oil..........	CH_3NCS..............	73.13	$1.0691^{\frac{37}{4}}$
10	naphthaline (α).......	$C_{10}H_7.CH_3$............	142.08	1.0005^{19}
11	" (β)......	$C_{10}H_7.CH_3$............	142.08	....
12	naphthyl amine (α)...	$CH_3NHC_{10}H_7$..........	157.13	....
13	" ether (α)...	$CH_3.O.C_{10}H_7$..........	158.08	$1.0964^{\frac{14}{4}}$
14	" " (β)...	$CH_3.O.C_{10}H_7$..........	158.08	....
15	nitrate..............	CH_3NO_3..............	77.03	1.2167^{15}
16	nitrite...............	CH_3NO_2..............	61.03	0.991^{15}
17	nitro-benzoate (o.) (K.)	$NO_2.C_6H_4.CO_2.CH_3$.....	181.09	$1.284^{\frac{25}{25}}$
18	" " (p.) (K.)	$NO_2.C_6H_4.CO_2.CH_3$.....	181.09	....
19	nitrolic acid..........	$CH(NO_2)NOH$.........	90.10	....
20	nonyl ketone.........	$CH_3.CO.C_9H_{19}$..........	170.18	0.8268^{20}
21	octyl ether..........	$CH_3.O.C_8H_{17}$..........	144.16	$0.802^{\frac{5}{0}}$
22	" ketone........	$CH_3.CO.C_8H_{17}$.........	156.16	0.825^{20}
23	oxalate..............	$(CH_3)_2C_2O_4$............	118.05	1.1479^{54}
24	palmitate............	$C_{16}H_{31}O_2.CH_3$..........	270.27	....
25	pelargonate..........	$C_9H_{17}O_2.CH_3$..........	172.16	0.892^{0}
26	pentadecylacetylene...	$CH_3.C \vdots C(CH_2)_{14}CH_3$....	250.27	$0.8016^{\frac{20}{4}}$
27	pentamethylene......	$CH_3.C_5H_9$.............	84.10	$0.7501^{\frac{21}{4}}$
28	phenyl-acetate (K.)...	$C_6H_5.CH_2.CO_2.CH_3$.....	150.08	$1.063^{\frac{25}{25}}$
29	phenyl carbinol (K.)..	$CH_3(C_6H_5)CHOH$......	122.08	$1.003^{\frac{25}{25}}$
30	" hydrazine ($\alpha\alpha$).	$C_6H_5(CH_3)N.NH_2$......	122.16	....
31	phosphine...........	CH_3PH_2..............	48.04	....
32	phthalate (K.).......	$C_6H_4(CO_2.CH_3)_2$........	194.08	$1.189^{\frac{25}{25}}$
33	piperidine...........	$C_5H_{10}N.CH_3$...........	99.15	0.821^{15}
34	propargyl ether......	$CH_3.O.C_3H_3$...........	70.05	0.83^{12}
35	propionate...........	$C_2H_5.CO_2.CH_3$.........	88.06	$0.9372^{\frac{0}{4}}$
36	propyl acetic acid....	$CH_3(C_3H_7)CH.CO_2H$....	116.10	0.9414^{0}
37	" acetylene.......	$CH_3.C \vdots C.C_3H_7$.........	82.08	$0.7377^{\frac{13}{0}}$
38	" ether..........	$CH_3.O.C_3H_7$...........	74.08	0.7460^{0}
39	" ketone........	$CH_3COC_3H_7$...........	86.08	0.812^{15}
40	" ketoxime (K.)...	$CH_3.CO(NOH).C_3H_7$....	101.13	$0.9045^{\frac{25}{25}}$

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	v. s. sol.	∞	∞	....	177–9°	colorless.....
2	....	....	....	....	116.7°	....
3	soluble	....	....	....	144.8° C.	....
4	v. v. sol.	∞	∞	....	242–6° dec.	colorless.....
5	∞	∞	∞	123°	dec.	monocl. pris.
6	....	....	....	abt. −80°	181.5° C.	....
7	....	....	....	52°	....	small leaflets
8	insoluble	∞	∞	−130.5°	20°	yellow oil....
9	....	....	....	35°	119°	....
10	....	v. soluble	v. soluble	−22°	240–2°	....
11	....	....	....	32.5°	241–2°	monocl./al...
12	....	v. soluble	v. soluble	....	293°	red oil......
13	....	v. soluble	v. soluble	< −10°	$269^{\circ 753}$ C.	....
14	s. soluble	s. soluble	v. soluble	72°	274°	small leaf/et.
15	s. soluble	soluble	soluble	....	65° exp.	....
16	....	....	....	....	−12°	....
17	insoluble	∞	∞	−8°	286–9°	yellow oil....
18	insoluble	soluble	soluble	95–6°	....	flat yel. nd...
19	v. soluble	....	soluble	64°	....	needles......
20	....	....	....	15°	$230.6^{\circ 766}$ C.	....
21	....	....	....	....	173°	....
22	....	....	....	3.5°	211°	....
23	s. soluble	soluble	sol. CH_3OH	54.0°	163.3° C.	moncl. tab...
24	....	....	....	28°	....	crystals.....
25	....	....	....	....	213.5° C.	....
26	....	....	....	30°	$184^{\circ 15}$	....
27	....	....	....	....	72–3°	....
28	insoluble	∞	∞	....	218–20°	colorless.....
29	insoluble	∞	∞	....	201–5°	wh. → yel...
30	....	soluble	....	....	$227^{\circ 745}$	....
31	s. soluble	s. soluble	7000 c.c.	....	−14°	....
32	insoluble	∞	∞	....	278–81°	yellow ......
33	v. soluble	....	....	....	107°	....
34	s. soluble	∞	∞	....	61–2°	....
35	....	∞	∞	< −75°	79.9°	....
36	0.57^{17}	soluble	soluble	....	$193^{\circ 748}$	....
37	....	....	....	....	83–4°	....
38	mod. soluble	∞	∞	....	38.9°	....
39	....	....	....	....	102.° C.	....
40	soluble	∞	∞	....	165–9°	colorless.....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Methyl pyrrol** (1)	$C_4H_4N.CH_3$	81.10	$0.9145^{\frac{15}{4}}$
2	" (2)	$C_4H_4N.CH_3$	81.10	$0.9446^{\frac{15}{4}}$
3	pyrryl ketone	$C_4H_4N.CO.CH_3$	69.10	...
4	pyruviate	$C_3H_3O_3.CH_3$	102.05	1.154^{0}
5	quinoline (6)	$CH_3.C_6H_3.C_3H_3N$	143.11	$1.0664^{\frac{20}{4}}$
6	" (py. 3)	$C_{10}H_9N$	143.11	1.0646^{20}
7	racemate (K.)	$<[.CH(OH).CO_2.CH_3]_2$	178.08	...
8	salicylate	$OHC_6H_4CO_2CH_3$	152.06	$1.189^{\frac{15}{15}}$
9	" (K.)	$OHC_6H_4CO_2CH_3$	152.06	$1.182^{\frac{25}{25}}$
10	selenide	$(CH_3)_2Se$	109.25	>1
11	succinate	$(CH_3O_2C)_2C_2H_4$	146.08	$1.1208^{\frac{20}{4}}$
12	sulphocyanate (K.)	$CN.S.CH_3$	73.12	$1.073^{\frac{25}{25}}$
13	stearate	$C_{18}H_{35}O_2.CH_3$	298.30	...
14	sulphate	$(CH_3)_2SO_4$	126.11	1.3276^{20}
15	sulphide	$(CH_3)_2S$	62.11	$0.8458^{\frac{21}{4}}$
16	sulphite	$(CH_3)_2SO_3$	110.11	1.0456
17	sulphocyanide	$CH_3.S.CN$	73.13	$1.0693^{\frac{24}{4}}$
18	sulphone chloride	CH_3SO_2Cl	114.54	1.51
19	sulphonic acid	$CH_3.SO_3H$	96.09	...
20	sulphuric acid	CH_3HSO_4	112.09	...
21	tartrate (K.)	$<[.CH(OH).CO_2.CH_3]_2$	178.08	...
22	telluride	$(CH_3)_2Te$	157.64	...
23	tetramethylene	$CH_3.C_4H_7$	70.08	...
24	triazoate	$CH_3.N_3$	57.15	$0.896^{\frac{8}{15}}$
25	trichlo-acetate	$CCl_3.CO_2CH_3$	177.38	$1.6733^{\frac{35}{4}}$ ....
26	trimethyl acetate	$(CH_3)_3C.CO_2.CH_3$	116.10	...
27	trimethylene	$CH_3.C_3H_5$	56.06	0.6912^{-20}
28	urea	$NH_2CONHCH_3$	74.13	...
29	uric acid (α) (3)	$CH_3.C_5H_3N_4O_3+\frac{1}{2}H_2O$	191.22	...
30	" (γ) (7)	$CH_3.C_5H_3N_4O_3+H_2O$	200.23	...
31	valeriate	$C_4H_9.CO_2.CH_3$	116.10	0.9097^{0}
32	**Methylene acetate**	$(CH_3CO_2)_2CH_2$	132.06	...
33	bromide	CH_2Br_2	173.94	2.4930
34	chloride	CH_2Cl_2	84.92	$1.3778^{\frac{0}{4}}$
35	cyanide	$CH_2(CN)_2$	66.10	...
36	diethyl ether	$CH_2(OC_2H_5)_2$	104.10	0.851^{0}
37	disulphonic acid	$CH_2(SO_3H)_2$	176.15	...
38	iodide	CH_2I_2	267.96	3.3326^{15}
39	**Milk sugar**	$C_{12}H_{22}O_{11}+H_2O$	360.19	1.525^{20}
40	**Monacetin**	$C_2H_3O_2.C_3H_5(OH)_2$	134.80	$1.2212^{\frac{15}{15}}$
41	**Mono-ethyl carbonate**	$C_2H_5HCO_3$	90.05	...

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	insoluble	∞	∞	....	112–3°^{747}	....
2	....	....	....	....	147–8°^{750}	....
3	v. soluble	v. soluble	v. soluble	90°	220°	moncl. need..
4	....	....	....	....	134–7°	....
5	....	....	....	....	257.4–8.6^{745}	....
6	....	....	....	10–14°	250°^{710}	....
7	v. soluble	soluble	s. soluble	90–1°	....	wh. tab. & pr.
8	s. soluble	∞	∞	−8.3°	222.2° C.	[yellowish
9	....	soluble	∞	−8°	221–3°	colorless to
10	insoluble	....	....	....	58.2°	....
11	....	....	....	18.5°	195.3° C.	crystals.....
12	insoluble	∞	∞	....	130.5–2.5°	colorless ....
13	....	....	soluble	38°	....	crystals/e....
14	....	....	soluble	....	188.3-8.6 C.	oil..........
15	....	soluble	soluble	−83.2°	38°^{760}	oil..........
16	....	soluble	soluble	....	121.5°	....
17	....	....	....	....	132.9^{757}	....
18	insoluble	soluble	soluble	....	160°	....
19	v. soluble	....	....	....	dec. 130°	syrup.......
20	v. soluble	soluble	∞	< −30°	....	oil..........
21	v. soluble	soluble	s. soluble	49.5–50.5°	....	wh. tablets..
22	insoluble	....	....	....	82°	brass color...
23	....	....	....	....	39–42°	....
24	....	....	....	....	20–1°	....
25	decom.	decom.	soluble	34°	191–2°	....
26	....	....	....	....	100–2°	....
27	s. soluble	....	....	....	4–5°	....
28	v. soluble	v. soluble	0.0725	102°	dec.	prisms......
29	0.382^{100}	v. v. s. sol.	sol. KOH	>360° dec.	....	small pris./w.
30	1.25^{100}	....	sol. KOH	no m.p.	dec. 370–80	fine leafl./w..
31	....	....	....	....	127.3°	....
32	....	....	....	....	170°	....
33	1.148^{20}	....	....	....	98.5°^{756}	....
34	2.00^{20}	....	....	....	41.6° C.	....
35	13.33	40; 10 chlo.	20; 6 7 bz.	....	109°^{20}	....
36	9.1^{18}	....	....	....	89° C.	....
37	deliq.	....	....	....	....	needles......
38	....	....	soluble	4°	180° dec.	leaflets......
39	17.03^{10}	insoluble	insoluble	203.5° dec.	dec.	rhombic.....
40	v. soluble	v. soluble	s. soluble	....	dec.	thick liq ....
41	....	....	....	−61–57°	....	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Mono**-ethyl fumarate	$CO_2H.C_2H_2.CO_2C_2H_5$	144.06	...
2	methyl carbonate	CH_3HCO_3	76.03	...
3	**Morphine**	$C_{17}H_{19}NO_3+H_2O$	303.21	1.317–1.326
4	**Mucic** acid	$(OH)_4C_4H_4(CO_2H)_2$	210.08	...
5	**Myricyl alcohol**	$C_{30}H_{61}OH$	536.50	...
6	**Myristic** acid	$C_{13}H_{27}CO_2H$	228.22	0.8622^{54}
7	aldehyde	$C_{13}H_{27}CHO$	212.22	...
8	**Naphthalene**	$C_{10}H_8$	128.06	1.0070^{25}_{25}
9	sulphone chloride(α)(K.)	$C_{10}H_7.SO_2.Cl$	226.57	...
10	" " (β)(K.)	$C_{10}H_7.SO_2.Cl$	226.57	...
11	sulphonic acid (α)	$C_{10}H_7SO_3H+H_2O$	226.14	...
12	" " (β)	$C_{10}H_7SO_3H$	208.12	...
13	**Naphthalic** acid (1) (8)	$C_{10}H_6(CO_2H)_2$	216.06	...
14	**Naphthoic** acid (α)	$C_{10}H_7.CO_2H$	172.06	...
15	" (β)	$C_{10}H_7.CO_2H$	172.06	...
16	aldehyde (α)	$C_{10}H_7.CHO$	156.06	...
17	" (β)	$C_{10}H_7.CHO$	156.06	...
18	**Naphthol** (α)	$C_{10}H_7.OH$	144.06	1.224^{4}
19	" (β)	$C_{10}H_7.OH$	144.06	1.217^{4}
20	sulphonic acid (α)(1, 2)	$OHC_{10}H_6SO_3H$	224.12	...
21	" acid (β)(2, 6)	$OHC_{10}H_6SO_3H$	224.12	...
22	**Naphtho**-phenazine ($\alpha\beta$)	$C_{16}H_{10}N_2$	230.16	...
23	-quinaldine (α)	$C_{13}H_8N.CH_3$	193.17	...
24	" (β)	$C_{13}H_8N.CH_3$	193.17	...
25	-quinoline (α)	$C_{13}H_9N$	179.11	...
26	" (β)	$C_{13}H_9N$	179.11	...
27	-quinone (α)	$C_{10}H_6O_2$	158.05	...
28	" (β)	$C_{10}H_6O_2$	158.05	...
29	**Naphthyl** acetate (α)	$C_2H_3O_2.C_{10}H_7$	186.08	...
30	" " (β)	$C_2H_3O_2.C_{10}H_7$	186.08	...
31	amine (α)	$C_{10}H_7.NH_2$	143.11	1.1229^{25}_{25}
32	" (β)	$C_{10}H_7.NH_2$	143.11	...
33	cyanide (α)	$C_{10}H_7.CN$	153.10	1.1167^{15}_{15}
34	" (β)	$C_{10}H_7.CN$	153.10	1.0939^{60}_{60}
35	**Naphthylene** diamine (1,2)	$C_{10}H_6(NH_2)_2$	158.16	...
36	" " (1, 5)	$C_{10}H_6(NH_2)_2$	158.16	...
37	" " (1, 8)	$C_{10}H_6(NH_2)_2$	158.16	...
38	**Naphthyl** ether (α)	$(C_{10}H_7)_2O$	270.12	...
39	" (β)	$(C_{10}H_7)_2O$	270.12	...

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	s. soluble	v. soluble	v. soluble	70°	$147°^{16}$	thin tablets. .
2	. . . .	. . . .	. . . .	−57–60°	. . . .	. . . .
3	0.0192^{20} 0.25^{100}	5^{20}; 7.5^{78} 0.066^{20}chlo.	0.0049^{5} wet 0.0595^{5} dry	243–4° 225°	$191–3°^{0}$	rhomb. pris. .
4	0.33	insoluble	. . . .	206° dec.	. . . .	cryst. powder
5	. . . .	. . . .	. . . .	88°	. . . .	sm. need./et.
6	insoluble	soluble	soluble	53.8°	$250.5°^{100}$	leaflets. . . . .
7	. . . .	. . . .	. . . .	52.5°	$168–9°^{22}$	. . . .
8	insoluble	5.29^{15} abs.	v. soluble	80.05° C.	217.68° C.	monoclinic . .
9	insoluble	soluble	v. soluble	66–7°	. . . .	fine tablets . .
10	insoluble	soluble	v. soluble	76–7°	. . . .	fine tablets . .
11	deliq.	soluble	s. soluble	85–90°	. . . .	crystalline. . .
12	not deliq.	. . . .	. . . .	. . . .	decom.	leafy crystals
13	v. v. s. sol.	s. soluble	s. soluble	no m.p.	. . . .	silky need./al
14	v. s. sol. hot	v. soluble	soluble	160.5–1.0°	300°	need./dil. al.
15	s. sol. hot	v. soluble	v. soluble	184° C.	>300°	moncl. tab. . .
16	. . . .	. . . .	. . . .	. . . .	291.6° C.	thick liquid. .
17	sol. hot	v. soluble	v. soluble	60.5–1°	. . . .	thin leaf./w. .
18	s. soluble	v. soluble	v. soluble	94–96°	278–80°	monoclinic. . .
19	s. sol. hot	v. soluble	v. soluble	122°	285–6°	moncl. leaf. . .
20	mod. sol.	. . . .	. . . .	>250°	. . . .	rhomb.tab./w
21	v. soluble	v. soluble	. . . .	122°	. . . .	small leaflets
22	. . . .	v. s. sol.	v. s. sol.	142.5°	>360°	lemon yel.
23	. . . .	. . . .	. . . .	. . . .	>300°	. . . .[pris./bz.
24	s. soluble	v. soluble	v. soluble	82°	>300°	large need.
25	v. s. sol.	v. soluble	v. soluble	52°	351° C.	moncl./et. . . .
26	v. s. sol.	v. soluble	v. soluble	93.5°	$349.5–50^{721}$	glit. scales/w.
27	s. soluble	soluble	v. soluble	125°	not in steam	yel. need./lig.
28	soluble	soluble	. . . .	115–20° de	not in steam	red. need./et.
29	mod.sol. hot	soluble	v. soluble	49°	. . . .	nd. or tab./al.
30	insoluble	v. soluble	v. soluble	70°	. . . .	small needles
31	0.167	v. soluble	v. soluble	50°	300.8° C.	rhomb. need.
32	soluble	soluble	. . . .	111–2°	306.1° C.	leaflets/w. . . .
33	. . . .	soluble	sol. lig.	37.5°	299° C.	needles. . . . . .
34	. . . .	v. soluble	sol. lig.	66.5°	306.5° C.	leaflets/lig. .
35	mod. sol.hot	v. soluble	v. soluble	95–6°	. . . .	rh'b. leaf./w.
36	v. s. sol.	soluble	soluble	189.5°	. . . .	prisms/et. . . .
37	s. soluble	∞	∞	66.5°	sub.	cryst./dil. al.
38	insoluble	s. soluble	v. sol.; v. sol. bz.	110°	>360°	leaflets. . . . .
39	v. sol. bz.	s. soluble	v. soluble	105°	$250°^{19}$	. . . .

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Naphthyl ketone** (αβ)	$C_{10}H_7.CO.C_{10}H_7$	282.12	
2	" (ββ) (a.)	$C_{10}H_7.CO.C_{10}H_7$	282.12	
3	" ketone (ββ) (b.)	$C_{10}H_7.CO.C_{10}H_7$	282.12	
4	**Narceïne**	$C_{23}H_{27}NO_8$	463.32	
5	**Narcotine**	$C_{22}H_{23}NO_7$	413.23	
6	**Neohexane**	$(CH_3)_3CC_2H_5$	86.12	$0.6488^{20°}_{0°}$
7	**Neopentane**	$(CH_3)_4C$	72.10	
8	**Nicotine**	$C_{10}H_{14}N_2$	162.20	$1.00924^{20°}_{4°}$
9	**Nicotinic acid**	$C_5H_4NCO_2H$	123.08	
10	**Nitraniline** (o.)	$NO_2.C_6H_4.NH_2$	138.13	1.443^{15}
11	" (m.)	$NO_2.C_6H_4.NH_2$	138.13	1.398^{18}
12	" (p.)	$NO_2.C_6H_4.NH_2$	138.13	1.437^{14}
13	**Nitro-**acetic acid	$CH_2NO_2.CO_2H$	105.07	
14	-alizarine (α)	$C_{14}H_7O_4.NO_2$	285.10	
15	" (β)	$C_{14}H_7O_4.NO_2$	285.10	
16	-anisol (o.) (K.)	$NO_2.C_6H_4.OCH_3$	153.10	(1.268^{20})
17	" (p.) (K.)	$NO_2.C_6H_4.OCH_3$	153.10	(1.233^{20})
18	-anthraquinone (α)	$C_{14}H_7O_2.NO_2$	253.10	
19	-benzaldehyde (o.)	$NO_2.C_6H\ .CHO$	151.08	
20	" (m.)	$NO_2.C_6H_4.CHO$	151.08	
21	" (p.)	$NO_2.C_6H_4.CHO$	151.08	
22	-benzamide (o.)	$NO_2.C_6H_4.CONH_2$	166.13	$1.4615^{32°}_{4°}$
23	" (m.)	$NO_2.C_6H_4.CONH_2$	166.13	
24	" (p.)	$NO_2.C_6H_4.CONH_2$	166.13	
25	-benzene	$C_6H_5NO_2$	123.08	$1.2033^{20°}_{4°}$
26	" (K.)	$C_6H_5NO_2$	123.08	1.2045^{25}_{25}
27	-benzoic acid (o.)	$NO_2.C_6H_4.CO_2H$	167.08	1.575^4
28	" " (m.)	$NO_2.C_6H_4.CO_2H$	167.08	1.494^4
29	" " (p.)	$NO_2.C_6H_4.CO_2H$	167.08	$1.5497^{32°}_{4°}$
30	-benzonitrile (o.)	$NO_2.C_6H_4.CN$	148.11	
31	" (m.)	$NO_2.C_6H_4.CN$	148.11	
32	" (p.)	$NO_2.C_6H_4.CN$	148.11	
33	-benzoylchloride (m.) (K.)	$NO_2.C_6H_4.COCl$	185.52	
34	" " (p.) (K.)	$NO_2.C_6H_4.COCl$	185.52	
35	-benzyl chloride (o.)	$NO_2.C_6H_4.CH_2Cl$	171.54	
36	" " (m.)	$NO_2.C_6H_4.CH_2Cl$	171.54	
37	" " (p.)	$NO_2.C_6H_4.CH_2Cl$	171.54	
38	-bromoform	NO_2CBr_3	297.92	2.811^{12}
39	-carbon	$C(NO_2)_4$	196.10	$1.650^{13°}_{4°}$
40	-cinnamic acid (o.)	$NO_2.C_6H_4.C_2H_2CO_2H$	193.10	
41	" " (m.)	$NO_2.C_6H_4.C_2H_2CO_2H$	193.10	

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	v. sol. bz.	1.4^{14}	v. soluble	135°	dist.	needles/al....
2	....	4	....	125.5°	....	needles/et....
3	....	0.08	v. s. sol.	164–4.5°	....	silky leaflets.
4	0.08^{13}	v. soluble	insoluble	170°	....	long pris./w..
5	insoluble	$1^{85\%20}$; 5^{78}	0 77; 2.1^{35}	176°	dec.	rhomb. pris..
6	....	soluble	soluble	....	49.7°	....
7	....	....	....	−20°	9.5°	....
8	∞	∞	∞	< −80°	$246.7^{\circ 745}$	....
9	s. soluble	mod. sol.	v. v. s. sol.	228–9°	sub.	fine needles..
10	0.125^{25}	v. soluble	v. soluble	71.5°	....	rhomb. need..
11	0.12^{24}	11.06	7.89^{20}	114°	285°	yel. rhb. need.
12	0.077^{20}	5.84^{20}	6.10^{20}	147°	....	yel. moncl./w
13	dec.	v. v. sol.	v. v. sol.	69°	....	prisms/et....
14	s. soluble	soluble	sol. KOH	289°	sub.	yel. need./al.
15	s. soluble	v. soluble	sol. chlo.	244° dec.	sub. dec.	orange need.
16	insoluble	∞	∞	9°	267–70°	yellow oil....
17	insoluble	v. soluble	v. soluble	53–4°	....	yel. prisms...
18	insoluble	v. s. sol.	v. v. s. sol.	228° C.	sub.	fine need./ace
19	0.0153^{25}	v. soluble	v. soluble	43.5–4.5°	$153^{\circ 23}$	yel. need./w.
20	0.0107^{25}	v. soluble	v. soluble	58°	$164^{\circ 23}$	needles .....
21	s. soluble	v. soluble	s. soluble	106°	....	prisms/w....
22	mod.sol. hot	mod. sol.	mod. sol.	176.6° C.	317°	short needles
23	sol. hot	....	....	142.7° C.	310–5°	needles......
24	s. sol. hot	....	....	201.4° C.	....	needles......
25	v. s. sol.	∞	∞	5.71°	$209.4^{\circ 745}$	....
26	s. soluble	soluble	∞	5–6°	209–10°	bright yellow
27	0.7316^{25}	28^{10}	21.6^{11}	147.70° C.	....	triclin. nd./w.
28	0.238^{15}	33^{10}	25.1^{11}	140–1°	....	moncl. tab./w
29	0.021^{15}	0.09^{10}	2.2^{11}	238°	....	leaflets/w....
30	sol. hot	v. soluble	v. soluble	110°	....	silky needles.
31	s. soluble	v. soluble	v. soluble	117–8°	....	needles......
32	s. soluble	v. sol. chlo.	....	147°	....	leaflets/al....
33	insol. dec.	soluble	v. soluble	35–6°	....	yel. prisms...
34	insol. dec.	soluble	v. soluble	72–3°	....	yel. prisms...
35	....	soluble....	....	48–9°	....	crystals/lig...
36	....	soluble....	....	45–7°	$173–83^{\circ}/^{30}$	yel. need./lig.
37	....	soluble....	....	71°	....	leaf. or need.
38	....	soluble	....	10.25°	$127^{\circ 11}876^{\circ 10}$	prisms......
39	insoluble	soluble	soluble	13°	126°	white cryst..
40	insoluble	s. soluble	....	237–40°	....	....
41	....	....	....	196–7°	....	yellow need..

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Nitro**-cinnamic acid (p.)	$NO_2.C_6H_4.C_2H_2CO_2H$	193.10	
2	-cresole (m.) (K.)	$C_6H_3.CH_3(NO_2)OH$ 1:3:4.	153.10	
3	-cumene o. + p.	$NO_2.C_6H_4.CH(CH_3)_2$	165.13	1.1025^{20}_{0}
4	-dimethyl aniline (m.)	$NO_2C_6H_4N(CH_3)_2$	166.16	1.313^{17}
5	" " (p.)	$NO_2C_6H_4N(CH_3)_2$	166.16	
6	-diphenyl (o.)	$C_6H_5.C_6H_4.NO_2$	199.11	
7	-diphenyl (p.)	$C_6H_5.C_6H_4.NO_2$	199.11	
8	-ethane	$CH_3.CH_2NO_2$	75.08	1.0561^{15}
9	-form	$CH(NO_2)_3$	151.13	
10	-guanidine (K.)	$NH_2.C(NH).NHNO_2$	104.19	
11	-isatine	$NO_2.C_8H_4NO_2$	192.11	
12	-methane	CH_3NO_2	61.07	1.1441^{15}
13	**Nitron**	$C_{20}H_{10}N_4$	312.29	
14	**Nitro**-naphthaline (α)	$C_{10}H_7.NO_2$	173.10	1.331^{4}
15	" (β)	$C_{10}H_7.NO_2$	173.10	
16	-naphthol (2) (α)	$NO_2.C_{10}H_6.OH$	189.10	
17	" (4)	$NO_2.C_{10}H_6.OH$	189.10	
18	" (1) (β)	$NO_2.C_{10}H_6.OH$	189.10	
19	-phenol (o.)	$NO_2.C_6H_4.OH$	139.08	1.657^{20}
20	" (m.)	$NO_2.C_6H_4.OH$	139.08	1.485^{20}
21	" (p.)	$NO_2.C_6H_4.OH$	139.08	1.479^{20}
22	-isophthalic acid (5)	$NO_2C_6H_3(CO_2H)_2+1\frac{1}{2}H_2O$	236.11	
23	-phthalic acid (3)	$NO_2C_6H_3(CO_2H)_2$	211.08	
24	" " (4)	$NO_2C_6H_3(CO_2H)_2+H_2O$	229.10	
25	-propane	$CH_3.CH_2.CH_2NO_2$	89.10	0.9999^{16}
26	-quinoline (5)	$C_9H_6N.NO_2$	174.13	
27	" (6)	$C_9H_6N.NO_2+XH_2O$	174.13	
28	" (7)	$C_9H_6N.NO_2$	174.13	
29	" (8)	$C_9H_6N.NO_2+XH_2O$	174.13	
30	-salicylic acid (3, 2, 1)	$NO_2C_6H_3(OH)CO_2H.H_2O$	201.10	
31	" " (5, 2, 1)	$NO_2C_6H_3(OH)CO_2H$	183.08	
32	" " (6, 2, 1)	$NO_2C_6H_3(OH)CO_2H$	183.08	
33	**Nitroso**-aniline (p.)	$NO.C_6H_4.NH_2$	122.13	
34	-benzene	$C_6H_5.NO$	107.08	
35	-diethylamine (K.)	$(C_2H_5)_2N.NO$	102.16	0.944^{25}_{25}
36	-diisobutylamine (K.)	$(C_4H_9)_2N.NO$	158.22	0.893^{25}_{25}
37	-dimethylamine (K.)	$(CH_3)_2N.NO$	74.13	1.041^{25}_{25}
38	-dimethyl aniline (p.)	$NO.C_6H_4N(CH_3)_2$	150.16	
39	-diphenyl amine	$NO.N(C_6H_5)_2$	198.16	
40	-dipropyl amine (K.)	$(C_3H_7)_2N.NO$	130.19	0.913^{25}_{25}
41	α-naphthol (2)	$NO.C_{10}H_6OH$	173.10	

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	v. s. sol. hot	s. soluble	insol. lig.	285–6°	....	prisms/al....
2	s. soluble	soluble	soluble	32–2.5°	....	yel. prisms ..
3	....	....	....	−35°	dec. 224°	....
4	insoluble	soluble	soluble	60–1°	280–5°	red mono pr..
5	insoluble	soluble	....	163–4°	....	long yel. need
6	....	....	....	37°	abt. 320°	tric. tab./al..
7	insoluble	mod. sol.	v. sol. chlo.	114–4.5°	340° C.	long need./al.
8	s. soluble	....	....	....	114–4.8°	....
9	mod. sol.	....	....	15°	explodes	white cryst..
10	v. s. sol.	v. s. sol.	insoluble	230–1°	....	pale needles..
11	s. soluble	v. soluble	sol. KOH	226–30°	....	rosettes/al...
12	s. soluble	sol. KOH	soluble	−28.5°	101–1.5°^{765}	oil.........
13	....	soluble	s. soluble	....	....	test for HNO_3
14	....	....	2.81^{15}	61°	304°	yellow need..
15	....	v. soluble	v. soluble	79°	....	rhomb. need.
16	v. s. sol.	s. soluble	....	128°	....	green yel. leaf
17	sol. hot	v. soluble	sol. acet.	164°	....	yel. need./w.
18	....	v. soluble	....	103°	....	yel. need....
19	s. soluble	v. soluble	v. soluble	44.27°	214°	monocl. pris..
20	s. soluble	v. soluble	v. soluble	96°	194°^{70}	monocl. tab..
21	v. s. sol.	v. soluble	....	115°	....	moncl. prisms
22	0.14^{15}	v. v. sol.	....	248–9°	....	thin leaflets.
23	v. s. sol.	v. soluble	v. soluble	219–20°	....	yel.moncl. pr.
24	v. soluble	v. soluble	v. soluble	161°	....	small needles
25	insoluble	....	....	130.5–1.5°	....	oil.........
26	s. sol. hot	sol. bz.	....	72°	sub.	v. fine ne./w.
27	sol. hot	v. s. sol.	s. sol. lig.	149–50°	sub.	v. fine needles
28	....	v. s. sol.	v. soluble	132–3°	....	silky need...
29	s. soluble	mod. sol.	mod. sol.	88–9°	....	moncl. need..
30	0.14^{15}	v. soluble	v. soluble	anhy. 144°	....	long needles.
31	0.176^{22}	v. soluble	....	229–30°	....	monocl. need.
32	sol. acetone	mod. sol.	v. soluble	195°	....	yellow need..
33	....	soluble	sol. bz.	173–4°	in steam	blue need./bz
34	sol. chlo.	mod. sol.	....	67.5–8°	....	rhombic.....
35	soluble	∞	∞	....	173–5°	yellow.......
36	v. s. sol.	∞	∞	−5°	219–21°	yellow.......
37	∞	∞	∞	....	146–9°	yellow.......
38	insoluble	soluble	soluble	87.8°	....	green leaflets
39	v. sol. bz.	s. soluble	....	66.5°	....	yel. quad. tab
40	s. soluble	∞	∞	....	204–5°	yellow.......
41	v. v. s. sol.	v. soluble	s. soluble	152°	....	yel. need./bz

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Nitroso-**α**-naphthol** (4)	$NO.C_{10}H_6OH$	173.10	....
2	β- " (1)	$NO.C_{10}H_6OH$	173.10	....
3	-phenol (p.)	$NO.C_6H_4.OH$	123.08	....
4	**Nitro-styrene** (o.)	$NO_2.C_6H_4.C_2H_3$	149.10	....
5	" (m.)	$NO_2.C_6H_4.C_2H_3$	149.10	....
6	" (p.)	$NO_2.C_6H_4.C_2H_3$	149.10	....
7	-thiophene	$NO_2.C_4H_3S$	129.13	....
8	-toluene (o.)	$NO_2.C_6H_4.CH_3$	137.10	1.1643^{15}_{15}
9	" " (K.)	$NO_2.C_6H_4.CH_3$	137.10	1.162^{25}_{25}
10	" (m.)	$NO_2.C_6H_4.CH_3$	137.10	1.168^{22}
11	" (p.)	$NO_2.C_6H_4.CH_3$	137.10	1.1392^{55}_{55}
12	-o-toluidine (3)	$C_6H_3(CH_3)(NH_2)NO_2$	152.14	....
13	" " (4)	$1:2:4 = CH_3:NH_2:NO_2$	152.14	1.365^{15}
14	" " (5)	$1:2:5 = CH_3:NH_2:NO_2$	152.14	1.366^{15}
15	" " (6)	$1:2:6 = CH_3:NH_2:NO_2$	152.14	1.378^{15}
16	-m- " (2)	$1:3:2 = CH_3:NH_2:NO_2$	152.14	....
17	" " (4)	$1:3:4 = CH_3:NH_2:NO_2$	152.14	....
18	" " (5)	$1:3:5 = CH_3:NH_2:NO_2$	152.14	....
19	" " (6)	$1:3:6 = CH_3:NH_2:NO_2$	152.14	....
20	-p- " (2)	$1:4:2 = CH_3:NH_2:NO_2$	152.14	....
21	" " (3)	$1:4:3 = CH_3:NH_2:NO_2$	152.14	1.312^{17}
22	-urea	$NH_2.CO.NHNO_2$	105.15	....
23	**Nonane** n.	$CH_3(CH_2)_7CH_3$	128.16	0.7228^{13}_{4}
24	"	$[(CH_3)_2CH.(CH_2)_2]_2CH_2$	128.16	0.7247^{0}
25	**Nondecane** n.	$CH_3(CH_2)_{17}CH_3$	268.32	0.7774^{32}_{4}
26	**Nondecylic acid**	$C_{18}H_{37}.CO_2H$	298.30	....
27	**Nonyl alcohol**	$CH_3(CH_2)_7CH_2OH$	144.16	0.8346^{10}_{4}
28	**Nonylene**	$CH(CH_2)_6CH: CH_2$	126.15	0.7433^{20}_{0}
29	**Nonylic acid**	$C_8H_{17}.CO_2H$	158.15	0.6890^{17}_{4}
30	**Octadecane** (n.)	$CH_3(CH_2)_{16}CH_3$	254.30	0.7768^{28}_{4}
31	**Octadecyl alcohol**	$CH_3(CH_2)_{16}CH_2OH$	270.32	0.8124^{59}_{4}
32	**Octadecylene** (n.)	$CH_3(CH_2)_{15}CH:CH_2$	252.29	0.7910^{18}_{4}
33	**Octane** (n.)	$CH_3(CH_2)_6CH_3$	114.15	0.7188^{0}_{4}
34	"	$[(CH_3)_2CH.CH_2.]_2$	114.15	0.7111^{0}_{4}
35	**Octochlor-propane**	$CCl_3.CCl_2.CCl_3$	319.60	....
36	**Octyl alcohol** (n.)	$CH_3(CH_2)_6CH_2OH$	130.15	0.8375^{0}
37	amine	$CH_3(CH_2)_7NH_2$	129.20	....
38	" (sec.)	$CH_3(CH_2)_5CH(NH_2)CH_3$	129.20	0.786
39	chloride (n.)	$CH_3(CH_2)_6CH_2Cl$	148.59	0.892^{4}_{0}
40	" (sec.)	$CH_3(CH_2)_5CHCl.CH_3$	148.59	0.8707^{15}

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	....	v. soluble	v. soluble	193–4° dec.	....	needles......
2	insoluble	2.4^{13}	v. soluble	106°	....	leaf. or prisms
3	mod. sol.	v. soluble	v. soluble	126°	....	monocl. pris..
4	sol. H_2SO_4	....	....	12–3.5°	....	oil..........
5	sol. chlo.	sol. abs.	soluble	−5°	....	yellow oil....
6	v. sol. bz.	v. sol. hot	v. soluble	29°	vol.in steam	prisms/lig...
7	....	....	....	44°	224–5°	monoclinic...
8	v. v. s. sol.	∞	∞	α−9.4°, β−3.6°	225.7° C.	dimorphous..
9	insoluble	soluble	∞	−10.5°	219–21°	bright yellow
10	v. v. s. sol.	∞	∞	16°	230–1°	....
11	insoluble	soluble	soluble	54°	$237.7^{\circ 760}$	rhombic.....
12	sol. chlo.	v. soluble	v. soluble	97°	....	orange prisms
13	....	soluble	soluble	107–9°	....	moncl. prisms
14	v. s. sol.	v. soluble	....	127–8°	....	monocl. pris.
15	s. soluble	v. soluble	v. soluble	91.5°	....	rhomb. leaf..
16	s. soluble	v. soluble	sol. acids	53°	....	yel. needles..
17	soluble	v. soluble	v. soluble	109°	....	yel. leaf./w..
18	v. s. sol.	v. soluble	v. soluble	98–98.4°	....	orange need..
19	sol. acid	soluble	s. sol. CS_2.	138°	....	long yel. need
20	soluble	s. sol. CS_2	....	77.5°	....	yel. monocl..
21	v. s. sol.	v. soluble	....	116–7°	....	red. monocl..
22	s. soluble	v. soluble	v. soluble	dec.	....	cryst. pow./al
23	....	....	....	< −51°	149.7° C.	....
24	....	....	....	....	132°	....
25	....	....	....	32°	330° C.	leaflets......
26	....	....	....	66.5°	$297–9^{\circ 100}$	glit. leaf./al .
27	soluble	∞	∞	−5°	215°	....
28	....	....	....	....	139.5° C.	....
29	soluble	soluble	soluble	12–2.5°	253–4°	leaflets......
30	....	....	....	28°	317° C. $98^{\circ 0}$	....
31	....	....	....	59°	$210.5^{\circ 15}$	glit. leaf./al..
32	....	....	....	18°	$179^{\circ 15}$	crystalline...
33	....	....	....	−98.2°	125.46° C.	....
34	....	....	....	....	108.53° C	....
35	....	soluble	soluble	160°	$268–9^{\circ 734}$	leaflets......
36	soluble	∞	∞	−17.9°	$195.5^{\circ} 96^{\circ 17}$	....
37	....	....	....	....	185–7°	....
38	....	....	....	....	162.5°	....
39	....	....	....	....	183.6-4.6C.	....
40	....	....	....	....	171–3° C.	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Octylene** (n.)	$CH_3(CH_2)_5CH:CH_2$	112.13	0.7223^{20}_{4}
2	**Octyl ether** (n.)	$(C_8H_{17})_2O$	242.27	0.8203^{0}
3	formate	$HCO_2.C_8H_{17}$	158.15	0.8929^{0}
4	**Oenanthaldoxime** (K.)	$CH_3(CH_2)_5CH:NOH$	129.16	...
5	**Oenanthol** (K.)	$CH_3(CH_2)_5CHO$	114.12	0.8025^{25}_{25}
6	**Oenanthylic acid**	$CH_3(CH_2)_5CO_2H$	130.12	0.9212^{15}_{4}
7	**Oleïc acid**	$C_8H_{17}CH:CH(CH_2)_7CO_2H$	282.28	0.8908^{12}_{4}
8	" " (K.)	$C_{18}H_{34}O_2$	282.27	0.889^{25}_{25}
9	**Oleïne**	$(C_{18}H_{33}O_2)_3C_3H_5$	884.83	...
10	**Opianic acid**	$(CH_3O)_2C_6H_2(CHO)CO_2H$	210.08	...
11	**Orceïn**	$C_{28}H_{24}N_2O_7$	500.27	...
12	**Orcin** 1:3:5	$CH_3.C_6H_3(OH)_2+H_2O$	124.06	1.2895^{4}
13	**Oxalacetic acid**	$CO_2H.CO.CH_2CO_2H$	132.03	...
14	**Oxalhydrazid**	$C_2O_2(NH.NH_2)_2$	118.21	...
15	**Oxalic acid**	$CO_2H.CO_2H+2H_2O$	126.04	1.653^{18}_{4}
16	**Oxaluric acid**	$NH_2.CO.NH.CO.CO_2H$	132.11	...
17	**Oxalyl chloride**	$ClOC.COCl$	126.90	...
18	**Oxamic acid**	$CO_2H.CONH_2$	89.04	...
19	**Oxamide**	$CONH_2\ CONH_2$	88.11	1.4756^{31}_{4}
20	**Oxanilic acid**	$CO_2H.CONHC_6H_5$	165.10	...
21	**Oxanilid**	$(.CONHC_6H_5)_2$	240.18	...
22	**Oximide**	$<(CO)_2>NH$	71.05	...
23	**Oxindol**	C_8H_7NO	133.10	...
24	**Oxyglutanic acid** (α)	$CO_2H.CHOH(CH_2)_2CO_2H$	148.06	...
25	**Oxythymol** 4:1:2:5	$(CH_3)_2CH(CH_3)C_6H_2$	166.12	...
26	**Palmitic acid**	$CH_3(CH_2)_{14}CO_2H\ .[(OH)_2$	256.26	0.8465^{76}_{4}
27	aldehyde	$CH_3(CH_2)_{14}CHO$	240.26	...
28	anhydride	$(C_{16}H_{31}O)_2O$	494.50	...
29	**Palmitin**	$(C_{16}H_{31}O_2)_3C_3H_5$	806.78	0.8657^{80}_{4}
30	**Palmitolic acid**	$C_{15}H_{27}.CO_2H$	252.23	...
31	**Palmitone**	$(C_{15}H_{31})_2CO$	450.50	0.7997^{83}_{4}
32	**Palmito-nitrile**	$C_{15}H_{31}CN$	237.29	0.8224^{31}_{4}
33	**Papaverine**	$C_{20}H_{21}NO_4$	351.21	1.308–1.337
34	**Papaverinic acid**	$C_{16}H_{13}NO_7$	331.05	...
35	**Parabanic acid**	$CO<(NHCO)_2>$	114.10	...
36	**Paracyanogen**	$(CN)_6$	156.24	...
37	**Paraformaldehyde**	$(CH_2O)x$	60.03	...
38	**Paraldehyde**	$(C_2H_4O)_3$	132.10	0.9943^{20}_{4}
39	**Pelargonic acid**	$CH_3(CH_2)_7CO_2H$	158.15	0.9100^{14}_{4}
40	**Penta-brombenzene**	C_6HBr_5	472.81	...

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	....	....	....	$124.6^{\circ 760}$	....
2	....	....	....	....	291.7°	....
3	....	....	....	....	198.1°	....
4	v. s. sol.	v. soluble	v. soluble	54–5°	....	sm. wh. tab..
5	....	soluble	∞	....	153–5°	colorless ....
6	0.241^{15}	soluble	soluble	−10.5°	$222.4^{\circ 743}$	....
7	insoluble	∞	∞	14°	$285.5\text{–}6^{\circ 100}$	needles......
8	insoluble	v. soluble	∞	7–9°	....	usually yel...
9	insoluble	s. soluble	v. soluble	−5°	dist.in vac.	oil..........
10	0.25; 1.7^{100}	soluble	soluble	150°	....	thin prisms..
11	sol. acetone	soluble	insol. bz.	....	....	small red crys
12	v. soluble	v. soluble	v. soluble	106.5–8° anhy.	287–90°	moncl. prisms
13	v. soluble	v. soluble	s. soluble	176–80° de.	....	dimorphous..
14	soluble	v. s. sol.	v. v. s. sol.	235° dec.	....	long need./w.
15	8.6^{20}; 37.1^{65}	40^{15}	1.27^{15}	187° anhy.	sub. 150°+	moncl. prisms
16	v. s. sol.	....	....	....	....	cryst. powder
17	fumes in air	reacts	soluble	−12°	64°	wh. need....
18	1.7^{17}	v. v. s. sol.	....	dec. 210°	....	cryst. powder
19	0.04	v. s. sol.	v. s. sol.	417–9° dec.	....	cryst. powder
20	s. soluble	v. soluble	v. soluble	149–50°	....	needles/w....
21	insoluble	v. s. sol.	v. s. sol.	252.50° C.	320°	scales.......
22	s. soluble	....	sol. NH_3	....	....	glit. prisms..
23	sol. hot	soluble	soluble	120°	dist.	long need./w.
24	v. soluble	v. soluble	....	72–3°	....	crystalline...
25	v. s. sol.	v. soluble	v. soluble	143°	290°	crystalline...
26	....	1.13^{0}	soluble	62.62°	$138\text{–}9^{\circ 0}$mm.	.........[et.
27	....	....	s. soluble	58.5°	$192\text{–}3^{\circ 22}$	pearly scales
28	....	....	....	55–6°	....	....
29	insoluble	0.0043^{21}	v. soluble	65.5°	$310\text{–}20^{\circ 0}$	....
30	insoluble	v. soluble	v. soluble	47°	$240^{\circ 15}$	silky needles.
31	....	....	....	82.8°	....	leaflets/al. ..
32	....	....	....	31°	$251.5^{\circ 100}$	hexag. tab...
33	v. v. s. sol.	soluble	0.4^{10}	147°	....	trimet. prism.
34	v. s. sol.	v. s. sol.	v. s. sol.	233° dec.	....	v. small tab..
35	4.72^{8}	soluble	....	....	....	monoclinic...
36	insoluble	insoluble	....	....	sub.	....
37	$20\text{–}30^{18}$	insoluble	insoluble	162° dry	....	amorphous...
38	12^{13}	....	....	12.55°	124° C.	....
39	s. soluble	soluble	soluble	12.5°	251–4° C.	leaflets......
40	mod. sol. bz	s. soluble	s. soluble	159–60°	sub.	need./al.....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Penta-chlor-aniline**	$Cl_5C_6NH_2$	265.31	....
2	" -benzene.......	C_6HCl_5	250.26	1.8342^{16}
3	-decane (n.).........	$CH_3(CH_2)_{13}CH_3$.........	212.26	0.7689^{20}_{4}
4	-erythrite............	$C(CH_2OH)_4$............	136.10	....
5	-ethyl benzene.......	$C_6H(C_2H_5)_5$...........	218.21	0.8963^{20}_{4}
6	-methylene..........	$(CH_2)_5$...............	70.08	0.7754^{14}_{4}
7	" diamine.........	$NH_2CH_2(CH_2)_3CH_2NH_2$..	102.20	0.8846^{15}_{4}
8	" dibromide.......	$CH_2Br(CH_2)_3.CH_2Br$....	230.00	1.7017^{16}_{0}
9	" cis-dicarbonic acid	$C_5H_8(CO_2H)_2$ (1:2)......	158.08	....
10	" oxide...........	$CH_2<(CH_2.CH_2)_2>O$ ...	86.08	0.8800^{0}
11	-methyl phenol.......	$(CH_3)_5C_6OH$...........	164.13	....
12	" rosaniline.....	$C_{24}H_{29}N_3O$.............	375.12	....
13	" benzoic ac....	$(CH_3)_5C_6CO_2H$..........	192.13	....
14	**Pentane** (n.)...........	$CH_3(CH_2)_3CH_3$.........	72.10	0.6454^{0}
15	**Pentaminobenzene**	$C_6H(NH_2)_5$.............	153.09	....
16	**Pentinoic acid**..........	$C_4H_5.CO_2H$............	98.05	....
17	**Perchlorether**..........	$(C_2Cl_5)_2O$.............	418.50	1.900^{14}
18	**Perseïte** (d. or l.).......	$C_7H_{16}O_7$..............	212.13	....
19	**Phenanthrene**..........	$<(C_6H_4.CH)_2>$........	178.08	1.063^{100}
20	**Phenanthrene-quinone**..	$C_6H_4CO_2CO_2C_6H_4$.......	208.06	1.4045
21	**Phenanthrol**...........	$C_{14}H_9OH$.............	194.08	....
22	**Phenanthroline**.........	$C_{12}H_8N_2+H_2O$..........	198.16	....
23	**Phenazine**.............	$C_6H_4<N_2>C_6H_4$.......	180.14	....
24	**Phenetol** (K.)..........	$C_6H_5OC_2H_5$...........	122.08	0.963^{25}_{25}
25	**Phenol**................	C_6H_5OH..............	94.05	1.0677^{35}_{35}
26	-phthaleïn...........	$(OHC_6H_4)_2CO.C_6H_4CO$..	318.12	1.2765^{32}_{4}
27	-sulphonic acid (o)....	$OH.C_6H_4.SO_3H$.........	174.11	....
28	" " (m.)...	$OH.C_6H_4.SO_3H+2H_2O$..	192.03	....
29	" " (p.)...	$OH.C_6H_4.SO_3H$.........	174.11	....
30	**Phenoxybenzoic ac.** (o.)	$C_6H_5OC_6H_4CO_2H$........	214.08	....
31	**Phentriazine** (α)........	$C_7H_5N_3$..............	131.16	....
32	**Phenyl-acetanilid** (K.)...	$C_6H_5.CH_2CO.HNC_6H_5$ ...	211.14	....
33	-acetate............	$CH_3.CO_2.C_6H_5$..........	136.06	1.0809^{15}_{15}
34	-acetic acid.........	$C_6H_5CH_2.CO_2H$.........	136.06	1.0778^{83}
35	-acetylene..........	$C_6H_5C\vdots CH$............	102.05	0.9371^{12}_{4}
36	-acridine (9)........	$C_6H_4NC(C_6H_5)C_6H_4$.....	255.15	....
37	-allylene...........	$C_6H_5.C\vdots C.CH_3$.........	116.06	....
38	-amimo-propionic acid	$C_6H_5CH_2.CH(NH_2)CO_2H$	165.13	....
39	-amimo " acid ($\beta\beta$)	$C_6H_5CH(NH_2)CH_2.CO_2H$	165.13	....
40	-anthracene.........	$C_6H_5.C_{14}H_9$............	254.12	....
41	-benzoate..........	$C_6H_5CO_2C_6H_5$..........	198.08	1.2345^{31}_{4}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	v. soluble	v. soluble	232°	....	long need./al.
2	....	v. v. s. sol.	v. v. sol.	85–6°	275–6°	fine need./al.
3	....	....	....	10°	270.5° C.	....
4	5.1^{15}	....	....	253°	....	tetragonal ...
5	....	....	....	< –20°	277° C.	....
6	....	....	....	....	50.2–.8°	oil..........
7	v. soluble	v. soluble	s. soluble	abt. 15°	178–9°	syrup.......
8	....	....	....	....	208–14° C.	....
9	soluble	....	....	140°	160°→anh.	long needles .
10	soluble	∞	∞	....	82–7°	....
11	....	....	....	125°	267°	needles/al....
12	insoluble	soluble	insoluble	130°	....	red brown
13	v. v. s. sol.	soluble	....	210.5°	sub.	fine need./w .
14	....	....	....	–147.5°	36–6.5° C.	....
15	v. soluble	insoluble	insoluble	....	....	needles......
16	v. soluble	v. soluble	v. soluble	102–3°	....	monc. tab./et.
17	....	....	....	69°	decom.	scales.......
18	6.9^{18}	v. s. sol.	....	188° C.	....	sm. needles. .
19	insoluble	2.62^{16}	v. soluble	100.35° C.	340°	moncl./al....
20	v. s. sol. hot	s. soluble	s. soluble	202°	>360°	yel. orange ne
21	s. soluble	v. soluble	v. soluble	152–3°	....	red. need./lig.
22	v. v. s. sol.	∞	v. v. s. sol.	117° anhyd.	>360°	hex.?/w.....
23	v. s. sol.	2	s. soluble	170–1°	>360° sub.	long yel. need.
24	....	soluble	∞	–34°	170–2°	colorless.....
25	6.7, ∞ 67.5	∞	∞	42.5–3°	182.6° C.	large rhb nee.
26	s. sol. hot	soluble	s. soluble	253–4°	....	triclinic.....
27	v. soluble	v. soluble	....	....	....	....
28	soluble	soluble	....	....	....	fine needles. .
29	soluble	soluble	....	.... [C.	....	syrup.......
30	v. v. s. sol.	v. soluble	v. soluble	113.5–4.5°	355° dec.	leaf./dil. al. .
31	v. sol. hot	v. soluble	v. soluble	74–5°	235–40°	yel. need. bz..
32	insoluble	3.3	1.1	116–7°	....	wh. leaf→gr.
33	v. v. s. sol.	∞	∞	....	196.7° C.	....
34	s. soluble	v. soluble	v. soluble	76.5°	265.5° C.	thin leaflets. .
35	....	....	∞	....	141.6°	....
36	....	s. soluble	mod. sol.	181°	403–4°	leaf. or prisms
37	....	....	....	....	185°	....
38	mod. sol.	v.s. sol. hot	insoluble	263–5° dec	sub. part.	leaf. or prisms
39	mod. sol.	v. soluble	v. v. s. sol.	120–1°	....	lrg. moncl./w.
40	....	v. soluble	v. soluble	152–3°	417°	leaflets/al....
41	v. v. s. sol.	mod. sol.	mod. sol.	68–9°	314° C.	moncl. prism.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Phenyl-benzoic acid (o.)	$C_6H_5.C_6H_4.CO_2H$	198.08	....
2	" " (m.)	$C_6H_5.C_6H_4.CO_2H$	198.08	....
3	" " (p.)	$C_6H_5C_6H_4.CO_2H$	198.08	....
4	-butyric acid (γ)	$C_6H_5(CH_2)_3CO_2H$	164.10	....
5	carbonate	$(C_6H_5)_2CO_3$	214.08	....
6	-crotonic acid ($\beta\gamma$)	$C_6H_5CH: CH.CH_2.CO_2H$	162.08	....
7	cyanide	C_6H_5CN	103.08	1.0102^{15}_{15}
8	" (K.)	C_6H_5CN	103.08	1.0235^{25}_{25}
9	disulphide	$(C_6H_5)_2S_2$	218.20	....
10	ditolylmethane	$C_6H_5.CH.(C_6H_4.CH_3)_2$	272.16	....
11	-ether	$(C_6H_5)_2O$	170.08	1.0728^{20} liq.
12	-ethylamine (K.)	$C_6H_5.C_2H_4.NH_2$	121.13	0.959^{25}_{25}
13	formanilid	$HCO_2N(C_6H_5)_2$	197.13	1.23
14	formate	$HCO_2C_6H_5$	122.05	....
15	-glucosazone (d.)	$C_{18}H_{22}N_4O_4$	358.34	....
16	-glyoxylic acid	$C_6H_5.CO.CO_2H$	134.05	....
17	-hydrazine	$C_6H_5HN.NH_2$	108.14	1.097^{23}
18	isocyanide	C_6H_5NC	103.08	0.9775^{15}
19	-α-lactic acid (β)	$C_6H_5CH_2.CH(OH).CO_2H$	166.08	....
20	-β-lactic acid (β)	$C_6H_5CH(OH).CH_2.CO_2H$	166.08	....
21	mustard oil	C_6H_5NCS	135.14	1.1382^{15}_{15}
22	naphthaline (α)	$C_{10}H_7.C_6H_5$	204.10	....
23	" (β)	$C_{10}H_7.C_6H_5$	204.10	....
24	β-naphthylamine	$C_{10}H_7.NH.C_6H_5$	219.15	....
25	α-naphthyl methane	$C_{10}H_7.CH_2.C_6H_5$	218.11	1.165^0
26	β- " "	$C_{10}H_7.CH_2.C_6H_5$	218.11	....
27	α-naphthyl ketone	$C_{10}H_7.CO.C_6H_5$	232.10	....
28	β " "	$C_{10}H_7.CO.C_6H_5$	232.10	....
29	-phenol (m.)	$C_6H_5.C_6H_4.OH$	170.08	....
30	" (p.)	$C_6H_5.C_6H_4.OH$	170.08	....
31	phosphine	$C_6H_5PH_2$	110.06	1.001^{15}
32	phosphinic acid	$C_6H_5PO(OH)_2$	158.06	1.475
33	phosphenige acid	$C_6H_5PO(OH)H$	142.06	....
34	-propiolic acid	$C_6H_5.C \vdots C.CO_2H$	146.05	....
35	-propyl alcohol (sec.)	$C_6H_5.CH(OH).C_2H_5$	136.10	0.994^{23}_{0}
36	" (γ)	$C_6H_5(CH_2)_2CH_2OH$	136.10	1.007^{15}
37	-pyrazolone (3) (K.)	$C_6H_5.C_3N_2H_3$	160.14	....
38	-pyridine (α)	$C_6H_5.C_5H_4N$	155.11	1.+
39	" (β)	$C_6H_5.C_5H_4N$	155.11	1.+
40	" ( )	$C_6H_5.C_5H_4N$	155.11	....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	s. sol. hot	v. soluble	v. sol. bz.	113.5–4.5°	343–4°	sm. need./al.
2	s. soluble	v. soluble	v. soluble	166° [C.	....	tablets/al
3	v. v. s. sol.	v. soluble	v. soluble	224°	sub.	long need./al.
4	mod.sol. hot	v. soluble	v. soluble	51.7°	290°	flat leaf./w...
5	....	....	sol. CCl_4	78°	301–2°	silky need./al.
6	v. s. sol.	v. soluble	v. soluble	86°	302°	thin need./w.
7	1^{100}	∞	∞	−12.9° C.	190.7° C.	....
8	1^{100}	soluble	∞	−17°	189–91°	colorless.....
9	insoluble	soluble	v. soluble	60–1°	310° dec.	needles .....
10	v. sol. chlo.	soluble	v. soluble *	55–6°	....	small prisms.
11	v. v. s. sol.	4.97^{-10}	soluble	26.9–7.0°	258.97° C.	monocl. pris.
12	soluble	∞	∞	....	197.5–9.5°	wh.→yel.
13	sol. hot	soluble	soluble	73–4°	210–20°°	orthorhomb.
14	....	....	....	....	179–80° de.	....
15	v. v. s. sol.	mod. sol. hot	....	217°	....	fine yel. need.
16	....	v. soluble	insol. CS_2	65–6°	....	crystalline...
17	v. s. sol.	∞	∞	19.6°	243.5°	monoclinic...
18	....	....	....	....	165–6° dec.	greenish.....
19	soluble	....	....	97–8°	....	thick pris./w.
20	v. soluble	....	....	93°	....	prisms......
21	insoluble	soluble	soluble	−21° C.	221° C.	....
22	....	v. soluble	v. soluble	no m.p.	324–5°	....
23	v. sol. bz.	v. soluble	v. soluble	102–2.5°	345° C.	leaflets......
24	sol. CH_3OH	soluble	v. sol. chlo.	107.5–8°	395–9.5°	thin needles..
25	50 CS_2	1.67^{15}; 3.3^{78}	50	58.6°	350°	tab./al., pr/e.
26	....	2.3^{15}	v. sol. bz.	35.5°	350°	monocl.pr/al.
27	....	2.49^{12}	....	75.5°	385°	rhomb. prisms
28	....	2.01^{12}	....	82°	....	rhomb. pris.
29	s. soluble	s. soluble	s. soluble	185°	....	leaflets/w....
30	sol. hot	v. soluble	v. soluble	164–5°	305–8°	silky need.
31	....	....	....	....	160–1°	/dil. al.
32	23.5^{15}	soluble	soluble	158°	250° dec.	rhomb. leaf..
33	7.1^{14}; 211^{100}	soluble	soluble	70°	dec.	leaflets......
34	v. s. sol.	v. sol.	v. sol.	136–7°	sub.	trimet. prisms
35	....	....	....	....	212°	....
36	s. soluble	∞	∞	< −18°	235°, $119^{\circ 12}$	thick liquid..
37	insoluble	s. soluble	s. soluble	239–40°	....	fine leaflets
38	insoluble	....	....	....	268.5–70.5°^{749}	....
39	insoluble	v. soluble	v. soluble	....	269–70°^{749}	oil..........
40	mod. sol hot	soluble	soluble	77–8°	274–5°	glit. leaf./w..

* Very soluble CS_2 and benzene.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Phenyl-**quinoline (α)	$C_6H_5.C_9H_6N$	205.13	
2	" (o.)	$C_6H_5.C_9H_6N$	205.13	
3	salicylate, salol	$OH.C_6H_4.CO_2.C_6H_5$	214.08	1.2614^{30}_{4}
4	semicarbazid (1)	$C_6H_5.NH.NH.CONH_2$	151.19	
5	" (4)	$NH_2.NH.CO.NHC_6H_5$	151.19	
6	sulphide	$(C_6H_5)_2S$	186.14	1.1185^{15}_{15}
7	sulphone	$(C_6H_5)_2SO_2$	218.14	
8	thiourea	$NH_2.CS.NHC_6H_5$	152.20	
9	toluene (o.)	$C_6H_5.C_6H_4.CH_3$	168.10	
10	" (m.)	$C_6H_5.C_6H_4.CH_3$	168.10	1.031^{0}
11	" (p.)	$C_6H_5.C_6H_4.CH_3$	168.10	1.015^{27}
12	o-tolyl ketone	$C_6H_5.CO.C_6H_4.CH_3$	196.10	
13	m-tolyl ketone	$C_6H_5.CO.C_6H_4.CH_3$	196.10	1.088^{17}
14	p-tolyl ketone	$C_6H_5.CO.C_6H_4.CH_3$	196 .10	
15	urea	$C_6H_5NH.CO.NH_2$	136.14	
16	**Phenylene-**diacetic ac.(o)	$C_6H_4(CH_2CO_2H)_2$	194.08	
17	" (m.)	$C_6H_4(CH_2CO_2H)_2$	194.08	
18	" (p.)	$C_6H_4(CH_2CO_2H)_2$	194.08	
19	-diamine (o.)	$C_6H_4(NH_2)_2$	108.14	
20	" (m.)	$C_6H_4(NH_2)_2$	108.14	1.1389^{15}
21	" (p.)	$C_6H_4(NH_2)_2$	108.14	
22	" (3)sulphonic ac.(o.)	$(NH_2)_2C_6H_3SO_3H+1\frac{1}{2}H_2O$	205.23	
23	**Phloroglucin**	$1:2:3C_6H_3(OH)_3+2H_2O$	162.08	
24	triethyl ether	$1:2:3C_6H_3(OC_2H_5)_3$	210.15	
25	trimethyl ether	$1:2:3C_6H_3(OCH_3)_3$	168.10	
26	trioxime	$C_6H_6(NOH)_3$	171.19	
27	**Phoron**	$[(CH_3)_2C:CH.]_2>CO$	138.12	0.8850^{20}_{4}
28	**Phosphenyl chloride**	$C_6H_5PCl_2$	178.94	1.319^{20}
29	**Phospho-benzene**	$C_6H_5P:PC_6H_5$	216.08	
30	**Phthalic acid**	$o.C_6H_4(CO_2H)_2$	166.05	1.585–1.593
31	aldehyde	$o.C_6H_4(CHO)_2$	134.05	
32	anhydride	$C_6H_4<(CO)_2>O$	148.03	1.527^{4}
33	**Phthalid**	$C_6H_4.CH_2.O.CO-$	134.05	
34	**Phthalimide**	$o.C_6H_4<(CO)_2>NH$	147.08	
35	**Phthalyl chloride** (o.)	$C_6H_4C_2O_2.Cl_2$	202.93	1.4214^{15}_{15}
36	" " (m.)	$C_6H_4C_2O_2.Cl_2$	202.93	
37	" " (p.)	$C_6H_4C_2O_2.Cl_2$	202.93	
38	**Picoline** (α) (K.)	$CH_3.C_5H_4N$	93.10	0.942^{25}_{25}
39	" (β)	$CH_3.C_5H_4N$	93.10	0.9613^{15}_{4}
40	" (γ)	$CH_3.C_5H_4N$	93.10	0.9571^{15}_{4}
41	**Picolinic acid** (2)	$C_5H_4N.CO_2H$	123.08	

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	s. soluble	v. soluble	v. soluble	86°	363°	long need.
2	....	v. soluble	v. soluble	....	$283^{\circ 187}$	thick oil.....
3	v. v. s. sol.	v. sol. hot	v. soluble	42–2.5°	$172–3^{\circ 12}$	rhomb tab .
4	s. soluble	v. soluble	....	172°	....	leaf./dil. al...
5	s. sol. hot.	v. soluble	insoluble	122°	....	rhomb. lf./w.
6	insol. ∞ bz.	soluble	∞; ∞ CS_2	thick −40°	$296^{\circ 760}$ C.	....
7	s. sol. hot	s. soluble	sol.; sol. bz.	128–9°	$376.4^{\circ 722}$	moncl.pris bz.
8	0.24^{25}	5.66^{25}	....	152°	....	trimet./al....
9	....	....	....	....	258–60°	....
10	....	....	....	....	272–7°	....
11	....	....	....	−2–3°	263–7°	....
12	.....[chlo.	....	....	< −18°	315–6° C.	....
13	∞ bz. and	∞	∞	....	$314–6^{\circ 745}$ C.	....
14	v. sol. bz.	mod. sol.	v. soluble	*	326° C.	hex. or moncl.
15	s. sol. hot	v. soluble	v. soluble	147°	....	moncl. need..
16	s. soluble	v. soluble	v. soluble	150°	....	fine needles..
17	soluble	v. soluble	v. soluble	170°	dist. dec.	needles/w....
18	v. s. sol.	v. soluble	v. soluble	244°	dist.	flat needles..
19	s. soluble	v. soluble	v. soluble	102–3°	256–8°	quad.tab./ch.
20	soluble	v. soluble	v. soluble	63°	282–4°	rhombic.....
21	mod. sol.	v. soluble	v. soluble	140°	267°	monoclin./w.
22	1.04^{10}	v. s. sol.	v. s. sol.	....	....	rhomb. tab...
23	1.1	v. soluble	v. soluble	217–9°	sub. dec.	rhomb. tab. .
24	insoluble	v. v. sol.	v. v. sol.	43°	$175^{\circ 24}$	(vol. with st)
25	v. sol. bz.	v. soluble	v. soluble	52°	255.5° C.	prisms/al....
26	v. s. sol.	v. s. sol.	sol. chlo.	exp. 155°	....	cryst. powd..
27	....	soluble	soluble	28°	198.5°	pale yel. cryst
28	dec.	∞ C_6H_6	∞ CS_2	....	224.6° C.	....
29	insoluble	insoluble	insoluble	149–50°	....	pale yel. pow.
30	0.54^{14}	11.8^{18} abs.	0.68^{15}	195° abt.	dec. 196°	rhombic.....
31	1.4 hot	soluble	soluble	56–6.5°	....	....
32	s. sol. hot	soluble	< 1°	128°	284.5° C.	rhomb. pris..
33	v. s. sol.	v. soluble	....	73°	290°	needles/w....
34	insol. bz.	insol. lig.	s. soluble	233.5° C.	sub.	hexag.pris./et
35	....	....	....	0°	281.5° C.	oil. ....
36	....	....	....	41°	276°	cryst. mass..
37	....	....	....	77–8°	259°	needles .....
38	∞	∞	∞	....	128–30°	colorless.....
39	∞	....	....	....	$143.4^{\circ 760}$ C.	....
40	....	....	....	....	142.5–4.5C.	....
41	v. soluble	v. soluble	v. v. s. sol.	137°	sub.	fine needles..

* The hexagonal crystals melt at 55°, while the monoclinic crystals melt at 60°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Picramide**	$NH_2C_6H_2(NO_2)_3$	228.19	...
2	**Picramic** acid (4:6:2)	$OH.C_6H_2(NO_2)_2NH_2$	199.16	...
3	**Picric** acid 1:2:4:6	$OH.C_6H_2(NO_2)_3$	229.15	1.767^{19}
4	**Picryl** chloride (K.)	$(NO_3)_3C_6H_2.Cl$	247.59	...
5	**Pimelic** acid (n.)	$CO_2H.(CH_2)_5CO_2H$	160.00	...
6	**Pinacoline**	$CH_3.CO.C(CH_3)_3$	100.10	0.8209^{0}_{0}
7	**Pinacone**	$[(CH_3)_2C(OH).]_2$	118.12	0.9672^{15}
8	**Pinacolyl** alcohol	$(CH_3)_3C.CH(OH).CH_3$	102.12	0.8347^{0}
9	**Pinene**	$C_{10}H_{16}$	136.13	0.8647^{20}
10	**Pinol**	$C_{10}H_{16}O$	152.13	0.9420^{20}
11	**Piperidine**	$CH_2<(CH_2.CH_2)_2>NH$	85.13	0.8606^{21}_{4}
12	**Piperonal**	$CH_2<O_2>C_6H_3.CHO$	150.05	...
13	**Piperonyl** alcohol	$CH_2<O_2>C_6H_3.CH_2OH$	152.06	...
14	**Polyglycolid**	$(CO.CH_2.O)x$	58.02	...
15	**Populin**	$C_{20}H_{22}O_8+2H_2O$	426.22	...
16	**Prehnitene**	$1:2:3:4C_6H_2.(CH_3)_4$	134.11	...
17	**Prehnitic** acid ... 1:2:3:4	$C_6H_2(CO_2H)_4+2H_2O$	290.12	...
18	**Propane**	$CH_3.CH_2.CH_3$	44.07	0.515^{16}
19	**Propargyl** acetate	$CH_3.CO_2.C_3H_3$	98.05	1.005^{20}_{4}
20	alcohol	$CH\vdots C.CH_2OH$	56.03	0.972^{20}_{4}
21	**Propiolic** acid	$CH\vdots C.CO_2H$	70.02	...
22	**Propion** amide	$C_2H_5.CONH_2$	73.10	0.9565^{76}_{4}
23	**Propionic** acid	$CH_3.CH_2CO_2H$	74.05	0.9937^{20}
24	" " (K.)	$CH_3.CH_2CO_2H$	74.05	0.991^{25}_{25}
25	aldehyde	$CH_3.CH_2CHO$	58.05	0.8066^{20}_{4}
26	anhydride	$(CH_3CH_2.CO)_2O$	130.08	1.0336^{0}_{4}
27	**Propyl** acetate (n.)	$CH_3CO_2.C_3H_7$	102.05	0.8908^{18}_{4}
28	-acetylene	$C_3H_7.C\vdots CH$	68.08	...
29	alcohol	$CH_3.CH_2.CH_2OH$	60.06	0.80358^{20}_{4}
30	amine	$CH_3.CH_2.CH_2NH_2$	59.11	0.7186^{20}
31	-benzene	$CH_3(CH_2)_2.C_6H_5$	120.10	0.8680^{13}_{4}
32	benzoate	$C_6H_5.CO_2(CH_2)_2CH_3$	164.10	1.0274^{15}_{4}
33	-benzoic acid (o.)	$CH_3(CH_2)_2.C_6H_4.CO_2H$	164.10	...
34	" " (p.)	$CH_3(CH_2)_2.C_6H_4.CO_2H$	164.10	...
35	bromide	$CH_3.CH_2.CH_2Br$	123.02	1.3640^{16}
36	butyl ether	$C_3H_7.O.C_4H_9$	116.13	0.7773^{0}
37	butyrate	$C_3H_7CO_2.C_3H_7$	130.12	0.8789^{15}
38	carbamate (K.)	$NH_2.CO_2.C_3H_7$	103.11	...
39	chlorcarbonate (K.)	$Cl.CO_2.C_3H_7$	122.50	1.083^{25}_{25}
40	chloride	$CH_3.CH_2.CH_2Cl$	78.51	0.8915^{18}
41	" (sec.)	$CH_3.CHCl.CH_3$	78.51	0.8588^{20}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	insoluble	insoluble	sol. acet.	188°	....	yel. mon. tab.
2	0.14^{22}	mod. sol.	s. soluble	168–9°	....	moncl. prisms
3	1.03^{20}	10	5.4^{15} wet	122.5°	exp.	yel. leaf./w...
4	insoluble	soluble	soluble	81–2°	....	yel. prisms...
5	5^{20}	v. soluble	v. soluble	105°	$272°^{100}$	rhombic/w...
6	2.36^{15}	....	soluble	....	106° C.	....
7	s. soluble	v. soluble	....	35–8°	172–3°	small needles
8	....	soluble	....	5.45°	120–1°	silky needles.
9	v. s. sol.	∞ abs.	∞, ∞ chlo	....	156°, $50°^{15}$	....
10	....	soluble	....	....	184°	....
11	∞	soluble	....	−17°	$106.2°^{759}$	....
12	0.2	∞^{78}	∞	37°	263°	long glit. crys
13	s. soluble	∞	∞	51°	dec.	long crystals.
14	insoluble	....	....	223°	dist. in vac.	powder......
15	0.4^{15}; 42^{100}	mod. sol.	soluble	180°	....	v. fine needles
16	....	....	....	−4°	204°	....
17	v. soluble	....	soluble	238° dec.	→anhyd.	large irreg. pr.
18	6.5 c.c.[18]	790 c.c.[17]	926 c.c.[17]	< −195°	−44.5°	....
19	....	soluble	soluble	....	124–5°	....
20	soluble	∞	∞	$+H_2O$, −17°	114–5°	....
21	soluble	soluble	soluble	6°	144° dec.	long crystals.
22	....	soluble	soluble	79°	213°	rhomb./chlo.
23	∞	∞	∞	−22° C.	140.7° C.	....
24	∞	∞	∞	....	140–1°	colorless.....
25	20^{20}	∞	∞	....	48.8° C.	....
26	s. soluble	....	....	....	168.6°	....
27	1.6	∞	∞	−92.5°	101.6°	....
28	....	....	soluble	....	48–9°	....
29	∞	∞	∞	....	97.4° C.	....
30	soluble	....	....	−127°	49°	....
31	insoluble	soluble	soluble	....	$158.2°^{752}$	....
32	....	....	....	....	230.7° C.	....
33	soluble	v. soluble	v. soluble	58°	$272°^{739}$	leaf./dil. al...
34	s. sol. hot	v. soluble	v. soluble	140°	....	leaflets/w....
35	....	∞	....	....	71.5° C.	....
36	....	....	....	....	117.1°	....
37	....	∞	∞	....	142.7°	....
38	v. soluble	v. soluble	soluble	59–60°	198–200°	flat pris.....
39	v. s. sol. dec	∞	∞	....	112–6°	colorless.....
40	....	....	....	....	46.5°	....
41	....	....	....	....	36.5°	....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Propyl cyanide**	$CH_3.CH_2.CH_2CN$	69.10	0.796^{15}
2	ether	$(CH_3.CH_2CH_2)_2O$	102.12	0.7465^{16}
3	fluoride	$CH_3.CH_2.CH_2F$	62.06	....
4	formate	$HCO_2.C_3H_7$	88.06	0.9095^{17}_{4}
5	glycollate	$C_5H_{10}O_3$	118.08	1.0621^{18}
6	hexamethylene	$C_3H_7.C_6H_{11}$	126.15	0.7671^{20}_{0}
7	hexyl ketone	$C_3H_7.CO.C_6H_{13}$	156.16	0.824^{20}_{0}
8	iodide	$CH_3.CH_2.CH_2I$	170.03	1.7472^{16}
9	" (K.)	$CH_3.CH_2.CH_2I$	170.03	1.742^{25}_{25}
10	isobutyl ketone	$C_3H_7.CO.CH_2.CH(CH_3)_2$	128.13	0.813^{22}_{0}
11	isovaleriate (K.)	$(CH_3)_2CH.CH_2.CO_2.C_3H_7$	144.13	0.862^{25}_{25}
12	mercaptan	$CH_3.CH_2.CH_2SH$	76.13	....
13	mustard oil	$C_3H_7.NCS$	101.15	0.9909^{0}
14	nitrate	$C_3H_7.NO_3$	105.10	1.0631^{15}
15	nitrite	$C_3H_7.NO_2$	89.10	0.935^{21}
16	phenol (m.)	$C_3H_7.C_6H_4OH$	136.10	....
17	phenyl ketone	$C_3H_7.CO.C_6H_5$	148.10	1.009^{0}
18	propionate	$C_2H_5.CO_2.C_3H_7$	116.10	0.8885^{13}
19	pyridine (α)	$C_3H_7.C_5H_4N$	121.13	<1.
20	sulphide	$(CH_3.CH_2.CH_2)_2S$	118.18	0.814^{17}
21	**Propylene**	$CH_3.CH:CH_2$	42.05	1.498
22	bromide	$CH_3.CHBr.CH_2Br$	201.97	1.9307^{18}
23	chloride	$CH_3.CHCl.CH_2Cl$	112.95	1.1656^{14}
24	iodide	$CH_2I.CH_2.CH_2I$	295.99	2.5614^{25}
25	oxide	$CH_3(CH.CH_2)O$	58.05	0.859^{0}
26	**Propylidene-acetic ac.**	$CH_3CH_2CH:CH.CO_2H$	100.06	0.9921
27	**Proto catechuic acid** . . 3,4.	$(OH)_2C_6H_3.CO_2H+H_2O$	172.07	1.5415^{4}
28	aldehyde	$3,4(OH)_2C_6H_3.CHO$	138.05	....
29	**Pseudo-cumene**	$1:2:4C_6H_3(CH_3)_3$	120.10	0.8810^{15}_{15}
30	" " (K.)	$1:2:4C_6H_3(CH_3)_3$	120.10	0.8745^{25}_{25}
31	**Pseudo-cumenol**	$2:4:5(CH_3)_3C_6H_2.OH$	136.10	....
32	phenanthroline	$C_{12}H_8N_2+4H_2O$	252.21	....
33	**Purpurin** 1:2:4	$(OH)_3C_6H<(CO)_2>C_6H_4$	256.06	....
34	**Pyrazine**	$N<(CH.CH.)_2>N$	80.11	....
35	**Pyrazole**	$-NH.N.CH.CH.CH-$	64.11	....
36	**Pyrazoline**	$NH<{N:CH \atop CH_2.CH_2}>$	66.13	....
37	**Pyrene**	$C_{16}H_{10}$	202.08	....
38	**Pyridazine**	$N_2<(CH.CH)_2>$	80.11	1.1108^{18}_{18}
39	**Pyridine**	$CH<(CH.CH)_2>N$	79.08	0.9779^{25}_{4}
40	" (K.)	$CH<(CH.CH)_2>N$	79.08	0.976^{25}_{25}

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	....	....	....	....	118.5°	....
2	soluble	∞	∞	....	91–1.2°	....
3	....	....	....	....	2°	....
4	s. soluble	∞	∞	< −75°	81°	....
5	....	....	....	....	170.5° C.	....
6	....	....	....	....	147.5–9.5°	....
7	....	....	....	−9°	206–7°	....
8	0.107^{20}	∞	∞	−98.8°	102.2° C.	....
9	....	∞	∞	....	101.5–2.5°	turns brown.
10	....	....	....	....	$155^{\circ 750}$	....
11	insoluble	∞	∞	....	153–6°	colorless.....
12	v. s. sol.	soluble	soluble	....	67–8°	....
13	....	....	....	....	153°	....
14	....	soluble	soluble	....	110.5°	....
15	....	soluble	soluble	....	57°	....
16	v. v. s. sol.	soluble	....	....	228°	crystalline...
17	....	soluble	....	21°	218°	....
18	s. soluble	∞	∞	....	122.4° C.	....
19	....	....	....	....	165–8°	....
20	insoluble	soluble	soluble	....	$141.5\text{-}2.5^{772}$	....
21	44.6 c.c.	1250 c.c.	....	< −180°	$-48.2^{\circ 749}$	....
22	0.245^{20}	soluble	....	....	141.6° C.	....
23	0.272^{20}	....	....	....	96.8° C.	....
24	....	....	....	....	227° dec.	....
25	33	∞	∞	....	35°	....
26	6.27^{20}	....	soluble	9.5–10.5°	200–1° C.	....
27	1.9^{14}	v. soluble	mod. sol.	199° dec.	....	monel. need..
28	5.0	v. soluble	v. soluble	153–4°	dec.	flat cryst./w.
29	....	....	....	....	169.8° C.	....
30	....	soluble	∞	....	168–70°	colorless.....
31	v. v. s. sol	v. soluble	v. soluble	71–2°	234–5°	fine needles w.
32	mod.sol. hot	v. soluble	s. soluble	173°	dist.	thin need./..
33	mod. sol.	soluble	soluble *	256°	dec.	red need./al.
34	∞	v. soluble	v. soluble	47°	$118^{\circ 760}$	tb./et.;pris.w.
35	v. soluble	v. soluble	v. soluble	69.5–70°	186–8°	long need./et.
36	∞	∞	....	....	144°	....
37	....	1.37	v. soluble	148–9°	far > 360°	monoclinic...
38	∞	v. soluble	v. soluble	−8°	$208^{\circ 760}$ C.	....
39	∞	....	soluble	−42°	$115.2^{\circ 760}$ C.	....
40	∞	∞	∞	....	113.5–4.5°	colorless.....

* Soluble CS_2, hot benzene, and toluene.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Pyridine** purified (K.)	$CH<(CH.CH)_2>N$	79.08	0.972^{25}_{25}
2	penta carbonic acid.	$C_5N(CO_2H)_5+2$ or $3H_2O$	299.08	...
3	sulphonic acid (3)	$C_5H_4N.SO_3H$	159.14	...
4	tricarbonic ac. (2, 3, 4)	$C_5H_2N.(CO_2H)_3+1\frac{1}{2}H_2O$	238.10	...
5	**Pyrocatechin**	$o.C_6H_4(OH)_2$	110.05	1.344
6	**Pyrocoll**	$C_4H_3N<(CO)_2>NC_4H_3$	186.13	...
7	**Pyrogallol**	$1:2:3C_6H_3(OH)_3$	126.05	1.463^{40}
8	trimethyl ether	$1:2:3C_6H_3(OCH_3)_3$	168.10	1.1118^{45}_{45}
9	**Pyromeconic acid**	$C_5H_4O_3$	112.03	...
10	**Pyromellitic** ac. (1, 2, 4, 5)	$C_6H_2(CO_2H_4)_4+2H_2O$	290.08	...
11	**Pyromucic acid**	$C_4H_3O.CO_2H$	112.03	...
12	**Pyrone**	$CO<(CH.CH)_2>O$	96.03	...
13	**Pyroracemic acid**	$CH_3CO.CO_2H$	88.03	1.2649^{25}
14	**Pyrotartaric acid**	$CH_3CH(CO_2H)CH_2CO_2H$	132.06	1.4105
15	**Pyrrol**	$<(CH.CH)_2>NH$	67.08	0.9669^{21}_{4}
16	**Pyrrolidine**	$NH<(CH_2.CH_2)_2>$	71.11	0.8520^{22}
17	**Pyrroline**	$NH<(CH_2.CH)_2>$	69.10	0.9097^{20}_{4}
18	**Pyrrone**	$CO(C_4H_3NH)_2$	164.10	...
19	**Pyruvic acid**	$CH_3.CO.CO_2H$	88.03	1.288^{18}
20	**Quercetin**	$C_{15}H_{10}O_7+2H_2O$	338.12	...
21	**Quercite** (d.)	$CH_2<[(.CHOH.)_2]_2>CHOH$	164.10	1.5845^{13}
22	**Quercitrine**	$C_{21}H_{22}O_{12}+2H_2O$	698.24	...
23	**Quinaldine**	py. $2.C_9H_6N.CH_3$	143.11	1.1013^{10}
24	**Quinic acid**	$(OH)_4C_6H_7.CO_2H$	192.10	1.637
25	**Quinic acid**	$CH_3O.C_9H_5N.CO_2H$	203.11	...
26	**Quinoline**	$<\substack{CH.CH\\CH.CH}>C_2<\substack{CH.CH\\N.CH}>$	129.10	1.0947^{20}
27	" (K.)		129.10	1.093^{25}_{25}
28	**Quinolinic acid**	$2:3C_5H_3N(CO_2H)_2$	167.05	...
29	**Quinone**	$CO<(CH.CH)_2>CO$	108.03	1.307–1 318
30	**Racemic acid**	$(CO_2H.CH(OH).)_2+H_2O$	168.07	1.697
31	**Raffinose**	$C_{18}H_{32}O_{16}+5H_2O$	594.34	1.465
32	**Resorcine**	$m.C_6H_4(OH)_2$	110.05	1.2717^{15}
33	dimethyl ether	$m.C_6H_4(OCH_3)_2$	138.08	1.0617^{15}_{15}
34	**Retene**	$C_{18}H_{18}$	234.15	1.13
35	**Rhamnite**	$CH_3[CH(OH)]_4.CH_2OH$	166.12	...
36	**Rhamnose**	$CH_3[CH(OH)]_4CHO.H_2O$	182.12	1.4708^{20}_{4}
37	**Ricinoleïc acid**	$C_{17}H_{32}(OH)CO_2H$	298.28	0.945^{15}
38	**Rosaniline**	$C_{20}H_{21}N_3O$	319.29	...
39	" (p.)	$(NH_2C_6H_4)_3COH$	305.18	...
40	**Rosinduline**	$C_{22}H_{15}N_3$	321.24	...

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	∞	∞	∞	....	113.5–8.0°	colorless.....
2	v. v. sol.	....	v. v. s. sol.	dec. 220°	....	imperfect reg.
3	v. soluble	v. s. sol.	insoluble	....	....	need. or leaf..
4	1.2^{15}	mod. sol.	insoluble	249–50°	....	rhomb. tab..
5	v. soluble	v. soluble	v. soluble	104°	245°	monoclinic...
6	insoluble	v. s. sol.	v. s. sol.	268–9°	sub.	moncl. tab...
7	44^{13}	100^{25}	83.3^{25}	132.5–3.5°	293°, $105^{\circ 0}$	thin leaf.& ne.
8	....	v. soluble	v. soluble	47°	241° C.	lg.need/dil.al.
9	soluble	soluble	s. soluble	117°	sub. 100°+	prisms......
10	14.2^{16}	v. soluble	....	265° anhy.	....	tricl. tab./w..
11	2.7^{0} ; 25^{100}	v. soluble	v. soluble	132.6–4.3°	sub. 100°+	moncl. prisms
12	v. v. s. sol.	soluble	v. soluble	32.5°	210–5°, $97^{\circ 13}$	prisms.......
13	∞	∞	∞	13.6°	165°, $65^{\circ 10}$	....
14	66.7^{20}	v. soluble	v. soluble	117–8°	....	triclin. prisms
15	insoluble	v. soluble	v. soluble	....	130–1°	....
16	∞	....	....	....	87.5–8.5°	....
17	v. v. sol.	....	....	....	90–1°	....
18	v. v. s. sol.	v. soluble	v. soluble	160°	....	trimet. need.
19	∞	∞	∞	13.6°	165° dec.	/et.
20	0.35	....	....	313–4° dec.	sub. part.	lem. yel. nd..
21	11^{20}	v. s. sol.	insoluble	234° or 225	....	moncl. prisms
22	0.04^{20}	0.25	0.80	168° dec.	....	yel.need.or lf.
23	....	....	....	....	246–7°	....
24	40^{9}	s. soluble	insoluble	161.6° C.	dec.	moncl. prisms
25	v. s. sol.	$1.24^{78\circ}$	v. v. s. sol.	280° dec.	sub. part.	yellow prisms
26	3	soluble	sol. sol. CS_2	−19.5°	240.4–1.3°	....
27	s. soluble	soluble	∞	....	237–8°	usually yel...
28	0.55^{9}	s. soluble	v. soluble	231°	dec.	moncl. prisms
29	s. sol. hot	v. soluble	v. soluble	115.7°	sub. need.	yel. m'cl.pris.
30	20.6^{20}	2.04	....	205–6°	....	triclinic.....
31	14^{20}	0.1^{20} 90%	....	118–9°anhy	dec. 130°	crystalline....
32	$147.3^{12.5}$	161^{15}	v. soluble	110°	280°	rhomb.tab./w
33	v. s. sol.	soluble	soluble	< −17°	217° C.	vol.withste'm
34	....	3	soluble	98.5°	390°, $135^{\circ 0}$	leaflets/al...
35	v. soluble	v. soluble	v. s. sol.	121°	....	triclin.pris./a.
36	50	s. soluble	....	92–3°	....	monoclin./w.
37	....	∞	∞	16–7°	$250^{\circ 15}$	cryst. mass..
38	s. soluble	soluble	insoluble	....	dec.	need. or tab..
39	insoluble	soluble	soluble	188–9°	....	red. leaflets..
40	insoluble	v. soluble	v. soluble	198–9°	....	brown lf./et..

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Rosolic acid	$C_{20}H_{16}O_3$	304.13	
2	Saccharic acid (d.)	$C_4H_4(OH)_4(CO_2H)_2$	210.08	
3	Saccharine (d.)	$(C_6H_{10}O_5)x$	162.08	
4	Saccharin	$C_6H_4<\genfrac{}{}{0pt}{}{CO}{SO_2}>NH$	183.14	
5	Salicin	$C_{13}H_{13}O_2(OH)_5$	286.15	1.426–1.434
6	Salicylamide	$OH.C_6H_4.CONH_2$	137.10	
7	Salicylic acid	$o.OH.C_6H_4.CO_2H$	138.05	
8	acetate	$C_2H_3O_2.C_6H_4.CO_2H$	180.06	
9	phenyl ether	$o.C_6H_5O.C_6H_4.CO_2H$	214.08	
10	aldehyde (K.)	$o.OH.C_6H_4.CHO$	122.05	1.165^{25}_{25}
11	anhydride	$C_{14}H_{10}O_5$	240.06	
12	Saligenin	$OH.C_6H_4.CH_2OH$	124.06	1.1613^{25}
13	Salol see Phenyl salicylate			
14	Santonin	$C_{15}H_{18}O_3$	246.14	1.1866
15	Sarcolactic acid	$CH_3.CH(OH).CO_2H$	90.05	
16	Sarcosine	$CH_3NH.CH_2CO_2H$	89.10	
17	Skatol	C_9H_9N	131.11	
18	Sebacic acid	$CO_2H.(CH_2)_8CO_2H$	202.15	
19	Semicarbazid	$NH_2.CO.NH.NH_2$	75.16	
20	Silicobenzoic acid	$C_6H_5.SiO_2H$	138.45	
21	Silicon tetraphenyl (K.)	$Si(C_6H_5)_4$	336.56	
22	triethyl phenyl	$C_6H_5Si(C_2H_5)_3$	192.56	0.9042^{0}
23	Silver fulminate	$C_2Ag_2N_2O_2$	299.94	
24	Sodium ethyl	NaC_2H_5	52.09	
25	glycerate	$NaC_3H_7O_3$	114.11	
26	Sorbic acid	$CH_3(CH:CH)_2CO_2H$	112.06	
27	Sorbinose	$C_6H_{12}O_6$	180.10	1.654^{15}
28	Sorbite (d.)	$C_6H_{14}O_6+\frac{1}{2}H_2O$	191.12	
29	Starch	$(C_6H_{10}O_5)x$ $x=46–50?$	162.08	1.499–1.513
30	Stearic acid	$CH_3(CH_2)_{16}CO_2H$	284.30	0.8428^{80}_{4}
31	aldehyde	$CH_3(CH_2)_{16}CHO$	268.30	
32	anhydride	$(C_{18}H_{35}O)_2O$	550.56	
33	Stearine	$(C_{18}H_{35}O_2)_3C_3H_5$	890.88	0.8621^{80}_{4}
34	Stearolic acid	$C_{17}H_{31}CO_2H$	280.26	
35	Stearone	$(C_{17}H_{35})_2CO$	506.56	0.7979^{89}_{4}
36	Stilbene	$C_6H_5.CH:CH.C_6H_5$	180.10	0.9707^{119}
37	Styrene	$C_6H_5CH:CH_2$	104.06	0.9121^{13}_{4}
38	Suberic acid	$CO_2H(CH_2)_6CO_2H$	174.12	
39	Suberone	$<(CH_2.CH_2CH_2)_2>CO$	112.10	0.9685^{0}
40	Suberyl alcohol	$<(CH_2.CH_2.CH_2)_2CHOH$	114.12	0.9595^{15}

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	v. s. sol.	v. sol. hot	mod. sol.	abt. 270°	dec.	red leaflets . .
2	v. soluble	v. soluble	s. soluble	. . . .	. . . .	. . . .
3	13^{15}	. . . .	. . . .	160–1°	volatile	large rhb. pris.
4	0.4305^{25}	3.12/90%	*	220° dec.	sub.	{monocl. /acetone
5	3.34^{15}; 85^{95}	soluble	insoluble	201°	230–40°	rhomb. lf. or pr.
6	s. soluble	. . . .	. . . .	139.9° C.	270° dec.	leaflets. . . . . .
7	0.2206^{25}	49.63^{15}	50.47^{15}	159.05° C.	sub. 75–6°^{0}	fine need./w. .
8	v. s. sol.	v. soluble	v. soluble	132°	dec. > 140°	fine need./w.
9	v. v. s. sol.	v. soluble	v. soluble	113°	355° dec.	leaf./dil. al. .
10	s. soluble	soluble	∞	−20°	196.70°^{760}	bright yellow
11	insoluble	v. soluble	v. soluble	200–20°	dec.	yel. amor.
12	6.7^{22}	v. soluble	v. soluble	86°	sub. 100° +	rhomb. tab. . .
13	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
14	0.02^{17}	2.0^{22}	1.3^{17}	169–70°	sub. dec.	trimet. t. or pr.
15	∞	∞	∞	. . . .	. . . .	syrup . . . .
16	v. soluble	s. soluble	. . . .	210–5°	. . . .	rhombic. . . . .
17	s. soluble	soluble	sol. lig.	95°	265–6°^{755}	glit. leaf./lig.
18	0.02^{25} 0.4^{65}	v. soluble	v. soluble	133–3.5°	294.5°^{100}	feath'y cryst.
19	v. soluble	soluble	v. sol. chlo.	96°	. . . .	pris./abs. al. .
20	insoluble	sol. KOH	v. soluble	92°	. . . .	glassy/et. . . . .
21	insoluble	v. s. sol.	v. s. sol.	230–1°	. . . .	fine leaflets . .
22	insoluble	. . . .	soluble	. . . .	230°	. . . .
23	0.075^{13}	v. sol. NH_3	insol. HNO_3	exp.	. . . .	small need. . .
24	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
25	decom.	soluble	. . . .	. . . .	. . . .	white powd. .
26	v. s. sol.	v. soluble	v. soluble	134.5°	228° dec.	needles/w . . .
27	200	s. soluble	. . . .	164°	. . . .	rhombic. . . . .
28	soluble	v. s. sol.	. . . .	110–1°	. . . .	crystalline . . .
29	insoluble	insoluble	insoluble	no m.p.	. . . .	amorphous . .
30	insoluble	0.1139 95%	soluble	69.32°	291°^{100}	leaflets. . . . . .
31	. . . .	. . . .	. . . .	63.5°	212–3°^{22}	scales/ether. .
32	. . . .	. . . .	. . . .	71–7°	. . . .	. . . .
33	insoluble	v. s. sol.	soluble	71–1.5°	. . . .	crystalline . . .
34	insoluble	s. soluble	v. soluble	48°	260°	long pris./al. .
35	. . . .	s. sol. hot	s. sol. hot	87.8°	. . . .	leaflets. . . . . .
36	. . . .	0.88^{17} abs.	7.88^{14}	124–5°	306–7°	monoclinic . . .
37	insoluble	∞	∞	. . . .	146°^{759} C.	. . . .
38	0.08^{0}–0.16^{20}	soluble	0.809	140°	300°; 152°^{0}	need. or tab. .
39	s. soluble	v. soluble	soluble	. . . .	178.5–9.5° C	oil. . . . .
40	. . . .	. . . .	. . . .	. . . .	184–5° C.	. . . .

* Sol. 2 in amylacet, 5 in ethylacetate, s. sol. bz, v. sol. HNO_3.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Succinamide**	$NH_2CO.(CH_2)_2.CONH_2$	116.14	....
2	**Succinic acid**	$CO_2H\ (CH_2)_2CO_2H$	118.05	1 552
3	anhydride	$<(CH_2.CO)_2>O$	100.03	1.1036^{20}_{4}
4	**Succinimide**	$<(CH_2.CO)_2>NH+H_2O$	117.10	....
5	**Succinyl chloride**	$ClCO(CH_2)_2COCl$	154.93	1.4123^{16}
6	**Sugar (cane)**	$C_{12}H_{22}O_{11}$	342.18	$1\ 588^{20}$
7	**Sulphamine** benzoic ac (o.)	$NH_2SO_2.C_6H_4.CO_2H$	201.16	....
8	" " " (m.)	$NH_2SO_2.C_6H_4.CO_2H$	201.16	....
9	" " " (p)	$NH_2SO_2.C_6H_4.CO_2H$	201.16	....
10	**Sulphanilic** acid (p)	$NH_2.C_6H_4.SO_3H+H_2O$	191.17	....
11	**Sulphoacetic** acid	$SO_3H.CH_2.CO_2H+H_2O$	158.11	....
12	**Sulphobenzid** (K)	$(C_6H_5)_2SO_2$	218.14	....
13	**Sulphobenzoic** acid (o)	$CO_2H.C_6H_4.SO_3H+3H_2O$	256.16	....
14	" " (m.)	$CO_2H.C_6H_4.SO_3H+2H_2O$	220.14	....
15	" " (p)	$CO_2H.C_6H_4.SO_3H+3H_2O$	256.16	....
16	**Sulphocyanic** acid	$CNSH$	59.11	....
17	**Sulphonal**	$(CH_3)_2C(SO_2C_2H_5)_2$	228.25	....
18	**Sylvestrene** (d)	$C_{10}H_{16}$	136.12	0.8510^{16}
19	**Talomucic** acid (d. or l.)	$CO_2H[CH(OH)]_4CO_2H$	210.08	....
20	**Tannin**	$C_{14}H_{10}O_9$	322.08	....
21	**Tartaric** acid (i.)	$[.CH(OH).CO_2H]_2+H_2O$	168.07	1.666
22	" (d.)	$CO_2H.[CH(OH)]_2CO_2H$	150.05	1.7598^{20}_{4}
23	" (l.)	$CO_2H.[CH(OH)]_2CO_2H$	150.05	1 764
24	amide (d.)	$[.CH(OH).CONH_2]_2$	148.14	....
25	**Tartronic** acid	$OHCH(CO_2H)_2+\frac{1}{2}H_2O$	120.03	....
26	**Taurine**	$NH_2.CH_2.CH_2.SO_3H$	125.16	....
27	**Taurocholic** acid	$C_{26}H_{45}NSO_7+H_2O$	533.48	....
28	**Teraconic** acid	$(CH_3)_2C{:}\ C(CO_2H).CH_2.CO_2H.$	158.08	....
29	**Teracrylic** acid	$C_3H_7CH{:}\ CH.CH_2CO_2H$	128.10	....
30	**Terebic** acid	$C_7H_{10}O_4$	158.08	0.8155^{24}_{4}
31	**Terephthalic** acid (p.)	$C_6H_4(CO_2H)_2$	166.05	....
32	aldehyde (p.)	$C_6H_4(CHO)_2$	134.05	....
33	nitrile (p.)	$C_6H_4(CN)_2$	128.11	....
34	**Terpenol**	$C_{10}H_{18}O$	154.15	....
35	**Terpentine** (pinene)	$C_{10}H_{16}$	136.13	0.8587^{20}
36	**Terpinene**	$C_{10}H_{16}$	136.13	0.8647^{20}
37	**Terpineol**	$C_{10}H_{18}O$	154.15	$0\ 9357^{20}$
38	**Terpinolene**	$C_{10}H_{16}$	136.13	....
39	**Tetrabrom-benzene** (s.)	$1{:}\ 2{:}\ 4{:}\ 5C_6H_2Br_4$	393.87	3.027^{20}
40	" (as.)	$1{:}\ 3{:}\ 4{:}\ 5C_6H_2Br_4$	393.87	....

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	0.45^{15}	insoluble	insoluble	242–3°	....	needles......
2	5.8^{20}; 28.1^{65}	9.99^{15}	1.19^{15}	185°	235°	monoclinic...
3	insoluble	soluble	v. s. sol.	119.6°	261°	trimetric/al..
4	v. soluble	mod. sol.	....	125–6°	287–8°	octah./acet..
5	....	....	....	16–7°	190–2° C.	....
6	198.6^{12}	0.4	....	189.2° C.	....	monoclinic...
7	v. soluble	v. soluble	v. soluble	165–7°	....	rhombohed..
8	v. s. sol.	v. soluble	s. soluble	238° C.	....	scales.......
9	v. v. s. sol.	v. soluble	....	dec. 280°	....	flat pris /w..
10	1.108^{20}	v. s. sol.	v. s. sol.	chars.280°+	....	rhomb. tab...
11	soluble	v. soluble	insol. abs.	84–6°	....	pris. tab./w..
12	insoluble	s. soluble	s. soluble	123–4°	....	tablets......
13	50	v. soluble	insoluble	130° anhy.	....	large trimet..
14	deliq.	....	v. soluble	141° anhy.	....	....
15	v. soluble	v. soluble	v. soluble	259–60°	....	needles......
16	∞^{0}	v. soluble	v. soluble	5°	....	....
17	2^{15}; 6.7^{100}	50/abs.^{78}	0.75^{15}	125–6°	300° dec.	thick prisms.
18	....	....	....	....	176–7°	.....[acetone
19	v. soluble	v. sol. hot	sol. acetone	158° dec.	....	v. sm. leaf.
20	20	167	v. s. sol.	dec. 210°	....	amorph. pow.
21	125^{15}	....	....	140° anh.	....	rectang. tab.
22	139	60^{25}	0.4	168–70°	....	monoclinic..
23	136.6	v. soluble	insoluble	170°	....	monoclinic..
24	....	soluble	....	....	....	rhombic.....
25	v. soluble	v. soluble	s. soluble	185–7° dry.	sub. 110°+	prisms/et....
26	6.5^{12}	insoluble	insoluble	88°	dec.	tetrag. need..
27	v. soluble	v. soluble	s. soluble	....	....	deliq. needles
28	v. soluble	v. soluble	v. soluble	164° dec.	→anhyd.	triclinic.....
29	....	....	....	$<-18°$	226–8° C.	....
30	s. soluble	soluble	soluble	174°	dec.	mono /al ...
31	0.0016	v. v. s. sol.	insoluble	no m.p.	sub.	needles .....
32	1.5^{100}	v. soluble	v. s. sol.	116°	245–8°	fine need /w.
33	....	s. soluble	s. sol. hot	222°	....	....
34	....	....	....	69–70°	volatile	thick pris./et.
35	v. s. sol.	∞ abs.	∞	....	156°; $50^{\circ 15}$	oil.........
36	....	....	....	....	179–82°	....
37	insoluble	v. soluble	v. soluble	35°	218°	transp.crys /et.......
38	....	....	....	....	183–5° C.	
39	....	....	....	174–5°	....	monocl. pris.
40	....	v. v. s. sol.	v. soluble	98.5°	329°	fine needles..

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Tetrabrom**-ethane (s.)	$CHBr_2.CHBr_2$	345.86	2.9716^{17}_{4}
2	-ethylene	$CBr_2.CBr_2$	343.84	....
3	**Tetrachlor**-aniline	$2{:}\,3{:}\,4{:}\,5NH_2.C_6HCl_4$	230.87	....
4	"	$2{:}\,3{:}\,5{:}\,6NH_2.C_6HCl_4$	230.87	....
5	-benzene (s.)	$1{:}\,2{:}\,4{:}\,5C_6H_2Cl_4$	215.82	1.858^{21}
6	" (as.)	$1{:}\,2{:}\,3{:}\,5C_6H_2Cl_4$	215.82	....
7	" (v.)	$1{:}\,2{:}\,3{:}\,4C_6H_2Cl_4$	215.82	....
8	-ether	$CCl_3.CHCl.O.C_2H_5$	211.85	1.4182^{15}
9	-ethylene	$CCl_2{:}\,CCl_2$	165.80	$1.6312^{9.4}_{4}$
10	-hydroquinone	$(OH)_2C_6Cl_4$	247.82	....
11	**Tetracosane** (n.)	$CH_3(CH_2)_{22}.CH_3$	338.40	0.7786^{51}_{4}
12	**Tetradecane** (n.)	$CH_3.(CH_2)_{12}.CH_3$	198.24	0.7645^{20}_{4}
13	**Tetradecylene** (n.)	$CH_3(CH_2)_{11}CH{:}\,CH_2$	196.24	0.7745^{15}_{4}
14	**Tetraethyl**-ammonium hy.	$(C_2H_5)_4NOH$	147.21	....
15	-benzene (s.)	$1{:}\,2{:}\,4{:}\,5C_6H_2(C_2H_5)_4$	190.18	0.8884^{16}_{4}
16	-silicon	$(C_2H_5)_4Si$	144.56	0.7682^{22}_{4}
17	**Tetrahydro**-benzaldehyde	$H_4C_6H_5CHO$	110.08	1.0091^{0}
18	-naphthaline (α)	$C_{10}H_{12}$	132.10	0.934^{23}_{0}
19	-phthalic acid (Δ′)	$C_6H_8(CO_2H)_2$	170.08	....
20	-quinoline (K.)	$C_9H_{11}N$	133.13	1.056^{25}_{25}
21	-toluene	$CH_3.C_6H_9$	96.10	0.8048^{20}_{4}
22	-m-xylene	$C_6H_8(CH_3)_2$	110.12	0.8019^{19}_{4}
23	**Tetrahydroxy**-benzene (s.)	$1{:}\,2{:}\,4{:}\,5C_6H_2(OH)_4$	142.05	....
24	-benzoic acid	$2{:}\,3{:}\,4{:}\,5(OH)_4C_6HCO_2H$	186.05	....
25	-quinone	$O_2C_6(OH)_4$	172.03	....
26	**Tetraiodo**-ethylene	$CI_2{:}\,CI_2$	531.88	2.983^{20}
27	-pyrrol	C_4I_4NH	570.89	....
	Tetramethyl			
28	-ammonium hydroxide	$(CH_3)_4NOH+5H_2O$	181.23	....
29	-anthracene	$C_{18}H_{18}$	234.15	....
30	-benzene (s.)	$1{:}\,2{:}\,4{:}\,5C_6H_2(CH_3)_4$	134.12	0.8380^{81}_{4}
31	-benzene (as.)	$1{:}\,2{:}\,3{:}\,5C_6H_2(CH_3)_4$	134.12	0.8961^{0}_{4}
32	" (v.)	$1{:}\,2{:}\,3{:}\,4C_6H_2(CH_3)_4$	134.12	0.8816^{9}
33	-diamino-benzophenone	$CO[C_6H_4N(CH_3)_2]_2$	268.24	....
34	" -diphenyl-amine	$NH[C_6H_4N(CH_3)_2]_2$	255.29	....
35	**Tetramethyl-diamino**			
36	-diphenyl-methane (p.)	$H_2C.[C_6H_4N(CH_3)_2]_2$	254.26	....
37	-triphenyl-methane	$C_6H_5CH[C_6H_4N(CH_3)_2]_2$	330.29	....
38	**Tetramethyl-silicon**	$(CH_3)_4Si$	88.50	<1.
39	**Tetramethylene-diamine**	$NH_2.(CH_2)_4.NH_2$ . . [$2H_2O$	88.18	....
40	-tetra carbonic acid	$1, 1, 2, 2\ C_4H_4(CO_2H)_4+$	268.10	....

* The crystals from benzene melt at 102°

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	....	....	< −20°	$137^{\circ 36}$	....
2	....	....	....	56°	$100^{\circ 15}$	tablets......
3	v. sol. bz.	v. soluble	v. soluble	118°	....	....
4	....	....	....	90°	....	....
5	mod. sol. CS_2	s. sol. hot	mod. sol.	140–1°	243–6° C.	moncl /CS_2..
6	....	v. s. sol.	....	50–1°	246°	needles......
7	v. sol. CS_2	s. soluble	v. soluble	45–6°	254°	needles......
8	....	....	....	....	$189.7^{\circ 759}$	....
9	....	....	....	....	121°	....
10	insoluble	v. soluble	v. soluble	232°	sub. dec.	moncl. pris
11	....	....	....	50.7–1.3°	$243^{\circ 15}$ 324.1°	/bz.
12	....	....	....	5.5°	252.5° C.	....
13	....	....	....	−12°	240–6°	....
14	v. deliq.	soluble	....	dec. 190°	dec.	needles......
15	....	....	....	13°	250° C.	....
16	insoluble	....	....	....	153°	....
17	insoluble	....	....	....	186–8°	....
18	....	....	....	....	208–12°	....
19	v. soluble	....	....	120° dec.	....	leaflets/w....
20	v. s. sol.	∞	∞	(abt. 20°)	246–50°	wh. →yel....
21	....	....	....	....	105–6° C.	....
22	....	....	....	....	122°	....
23	mod. sol.	mod. sol.	v. soluble	215–20°	....	glit. leaf./ace.
24	....	insol. lig.	....	147–8°	....	cryst./acet. e.
25	s. soluble	v. soluble	s. soluble	no m.p.	....	bluish cryst..
26	v. sol. CS_2	....	soluble	192° C.	sub. ⟶ tab.	monocl. pris.
27	0.02	5.8^{15}, 90%	50; sol. bz.	no m.p.	dec. 140–50	yel. n./dil. al.
28	220^{15}, ∞^{63}	v. soluble	....	62–3°	dec.	deliq. cryst...
29	....	....	....	abt. 280° d.	....	....
30	v. sol. bz.	v. soluble	v. soluble	79–80°	193–5°	moncl. leaf...
31	....	....	....	....	195–7°	....
32	....	....	....	−4°	204° C.	....
33	....	v. soluble	v. soluble	174° C.	> 360° dec.	glit. leaflets..
34	....	soluble	....	119°	....	quad.tab./CS_2
35						
36	....	soluble	....	90–1°	dist.	leaflets/al....
37	insoluble	mod. sol.	v. soluble	*	dist.	tric.n/bz.or al.
38	insoluble	....	....	....	30–1°	....
39	v. soluble	....	....	27–8°	158–60°	leaflets......
40	v. soluble	v. soluble	v. soluble	198–203°	....	thick pris./w.

while those from alcohol melt at 93–94°.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Tetranitro**-methane	$C(NO_2)_4$	196.16	1.650^{13}_{4}
2	-naphthaline (α)	$C_{10}H_4(NO_2)_4$	308.19	
3	" (β)	$C_{10}H_4(NO_2)_4$	308.19	
4	**Tetraphenyl**-ethane (s.)	$(C_6H_5)_2CH.CH(C_6H_5)_2$	334.18	1.182
5	-ethylene	$(C_6H_5)_2C{:}\ C(C_6H_5)_2$	332.16	
6	-methane	$(C_6H_5)_4C$	320.16	
7	**Tetrolic acid**	$CH_3.C{\vdots}\ C.CO_2H$	84.03	
8	**Thallin**	$C_9H_{10}NO.CH_3$	149.13	
9	**Theïne** (see Caffeïne)			
10	**Theobromine**	$C_7H_8N_4O_2$	180.22	
11	**Thiazol**	$1{:}\ 3N(CH)_3S$	85.13	1.1998^{17}
12	**Thio-acet-amide**	$CH_3.CS.NH_2$	75.14	
13	" -anilid	$CH_3.CS.NHC_6H_5$	151.17	
14	-acetic acid	$CH_3.COSH$	76.09	1.074^{10}
15	-benzoic acid	$C_6H_5.COSH$	138.10	
16	-carbamic acid	$NH_2.CS.SH$	93.19	
17	-carbanilid	$CS(NHC_6H_5)_2$	228.24	1.3205^{4}
18	-o-cresole	$CH_3.C_6H_4.SH$	124.12	
19	-m. "	$CH_3.C_6H_4.SH$	124.12	1.0625^{0}_{4}
20	-p. "	$CH_3.C_6H_4.SH$	124.12	
21	-cyanuric acid	$(CNSH)_3$	177.33	
22	-diphenyl amine	$S<(C_6H_4)_2>NH$	199.17	
23	-glycerine	$(OH)_2C_3H_5.SH$	108.12	1.295^{14}
24	-hydroquinone (p.)	$C_6H_4(SH)_2$	142.17	
25	-naphthen	C_8H_6S	134.11	
26	-α naphthol	$C_{10}H_7SH$	160.12	1.1549^{23}_{4}
27	-β- "	$C_{10}H_7SH$	160.12	
28	-oxamide	$NH_2SC.CSNH_2$	120.23	
29	-phene	$<(CH.CH)_2>S$	84.09	1.0705^{15}_{4}
30	" (K.)	$<(CH.CH)_2>S$	84.09	1.06^{25}_{25}
31	" alcohol	$C_4H_3S.CH_2OH$	114.11	
32	" aldehyde	$C_4H_3S.CHO$	112.09	1.215^{21}
33	" carbonic acid (α)	$C_4H_3S.CO_2H$	128.09	
34	" " " (β)	$C_4H_3S.CO_2H$	128.09	
35	-phenol (K.)	$C_6H_5.SH$	110.11	1.075^{25}_{25}
36	-phosgene	$CSCl_2$	114.96	1.5085^{15}
37	-resorcine	$C_6H_4(SH)_2(1{:}3)$	142.17	
38	-semicarbizid	$NH_2.CS.NH.NH_2$	91.22	
39	-urea	$NH_2.CS.NH_2$	76.17	1.406–1.450
40	**Thymol** (4:1:3)	$(CH_3)_2CH.C_6H_3(CH_3)OH$	150.12	0.979^{15}_{15}
41	**Thymo-quinone**	$(CH_3)_2CH.C_6H_2(CH_3)O_2$	164.10	
42	**Tiglic acid**	$CH_3.CH{:}\ C(CH_3).CO_2H$	100.06	0.9641^{76}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	insoluble	soluble	soluble	13°	126°	white cryst. .
2	v. v. s. sol.	v. v. s. sol.	v. v. s. sol.	259°	exp.	rhomb./chlo.
3	....	....	....	203°	exp.	long thin n./a
4	14 bz.	s. soluble	sol. acet.	211° C.	379–83° C.	rhomb. need .
5	....	v. s. sol.	v. s. sol.	223.5-4.5°C	415–25°	monoclinic . .
6	sol. bz.	....	insoluble	285°	$431^{\circ 760}$	wh. cryst./bz.
7	v. soluble	v. soluble	v. soluble	76°	203°	tablets......
8	v. s. sol.	v. soluble	v. soluble	42–3°	$283^{\circ 735}$	thick trim. pr
9	....	....	....	....	....	....
10	0.03^{18}	0.04^{21} 95%	0.032^{35}	329–30°	sub. 290°+	rhombic mic.
11	....	....	....	....	116.8° C.	....
12	v. soluble	soluble	....	107.5–8.5°	....	moncl.tab./et
13	insoluble	sol. KOH	....	75°	dec.	needles/w . . .
14	∞	∞	∞	$<-17°$	93°	....
15	insoluble	∞	∞	24°	....	crystals.....
16	v. soluble	v. soluble	v. soluble	....	....	needles......
17	insoluble	v. soluble	v. soluble	154°	dec.	trimet. tab.. .
18	insoluble	soluble	....	15°	$194.3^{\circ 760}$	leaflets......
19	....	....	....	$<-20°$	$195.4^{\circ 760}$	....
20	insoluble	soluble	v. soluble	43°	190.2–1.7°	leaflets/et . . .
21	v. sol. hot	v. s. sol.	v. s. sol.	no m.p.	dec. 200°	yel. needles. .
22	v. sol. bz.	s. soluble	mod. sol.	180°	371° dec.	thin rhomb. .
23	s. soluble	∞	insoluble	....	....	thick liquid. .
24	....	....	....	98°	....	hexag. leaf.. .
25	....	....	....	30–1°	220–1°	leaflets......
26	insoluble	v. soluble	v. soluble	....	285° dec.	....
27	....	soluble	v. soluble	81°	288° dec.	glit. scales/al.
28	s. soluble	sol. hot	s. soluble	dec.	....	yel. red. cryst
29	insoluble	soluble	sol. H_2SO_4	....	84° C.	....
30	insoluble	soluble	∞	....	83.5–4.5°	colorless ....
31	....	....	....	....	207° C.	....
32	....	....	soluble	....	198° C.	oily.........
33	0.75^{25}	v. soluble	v. soluble	126.5°	260° C. dec.	monocl. need .
34	0.43^{25}	....	....	138.4°	with steam	monocl.pris/w
35	insoluble	v. soluble	∞	....	168–9.5°	wh. → yel.. . .
36	....	....	....	....	73.5°	red..........
37	....	....	....	27°	243° $116.4^{\circ 11}$	crystalline....
38	soluble	....	....	181–3°	....	long need./w.
39	9	v. s. sol.	v. s. sol.	180°	....	thick rhb. pri.
40	0.083^{15}	v. soluble	v. soluble	49.65° C.	231.8°	hexag. or mo.
41	v. s. sol.	v. soluble	v. soluble	45.5°	233.5° C.	or. yel. tab....
42	s. soluble	soluble	soluble	64.5°	198.5°	triclinic .....

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Tiglic aldehyde**	$CH_3.CH:C(CH_3).CHO$	84.06	0.871^{15}
2	**Tin diethyl**	$Sn(C_2H_5)_2$	177.08	1.654
3	tetra-ethyl	$Sn(C_2H_5)_4$	235.16	1.187^{23}
4	" -methyl	$Sn(CH_3)_4$	179.10	1.3138^{0}
5	triethyl	$(C_2H_5)_3Sn.Sn(C_2H_5)_3$	412.24	1.4115^{0}
6	**Tolane**	$C_6H_5.C:C.C_6H_5$	178.08	....
7	**Toluene**	$CH_3.C_6H_5$	92.06	$0.8723\frac{15}{15}$
8	" (K)	$CH_3.C_6H_5$	92.06	$0.8625\frac{25}{25}$
9	sulphone-amide (o.)	$CH_3.C_6H_4.SO_2NH_2$	171.17	....
10	" " (p.)	$CH_3.C_6H_4.SO_2NH_2$	171.17	....
11	" chloride (o.)	$CH_3C_6H_4.SO_2Cl$	190.57	....
12	" " (p.)	$CH_3C_6H_4.SO_2Cl$	190.57	....
13	sulphonic acid (o.)	$CH_3.C_6H_4.SO_3H + 2H_2O$	208.16	....
14	" (m.)	$CH_3.C_6H_4.SO_3H + H_2O$	190.14	....
15	" (p.)	$CH_3.C_6H_4.SO_3H + 4H_2O$	244.17	....
16	**Toluic acid** (o.)	$CH_3.C_6H_4.CO_2H$	136.06	1.0621^{115}
17	" (m.)	$CH_3.C_6H_4.CO_2H$	136.06	$1.0543^{1\frac{1}{4}2}$
18	" (p.)	$CH_3.C_6H_4.CO_2H$	136.06	....
19	amide (o.)	$CH_3.C_6H_4.CONH_2$	135.11	....
20	" (m.)	$CH_3.C_6H_4.CONH_2$	135.11	....
21	" (p.)	$CH_3.C_6H_4.CONH_2$	135.11	....
22	anhydride (o.)	$(CH_3.C_6H_4.CO)_2O$	254.11	....
23	**Toluidine** (o.)	$CH_3.C_6H_4.NH_2$	107.11	$1.0031\frac{15}{15}$
24	" " (K.)	$CH_3.C_6H_4.NH_2$	107.11	$0.996\frac{25}{25}$
25	" (m.)	$CH_3.C_6H_4.NH_2$	107.11	$0.9961\frac{15}{15}$
26	" (p.)	$CH_3.C_6H_4.NH_2$	107.11	$0.973\frac{50}{50}$
27	**Tolunitrile** (o.) (K)	$CH_3.C_6H_4.CN$	117.10	$0.995\frac{25}{25}$
28	" (m.) (K.)	$CH_3.C_6H_4.CN$	117.10	$0.984\frac{25}{25}$
29	" (p.) (K.)	$CH_3.C_6H_4.CN$	117.10	....
30	**Tolyl carbinol** (o.)	$CH_3.C_6H_4.CH_2OH$	122.08	1.023^{40}
31	" (m.)	$CH_3.C_6H_4.CH_2OH$	122.08	1.036
32	" (p.)	$CH_3.C_6H_4.CH_2OH$	122.08	....
33	chloride (o.)	$CH_3.C_6H_4.CH_2Cl$	140.52	....
34	" (m.)	$CH_3.C_6H_4.CH_2Cl$	140.52	....
35	" (p.)	$CH_3.C_6H_4.CH_2Cl$	140.52	....
36	mustard oil (o.) (K.)	$CH_3.C_6H_4.N:CS$	149.16	$1.104\frac{25}{25}$
37	" " (p.) (K.)	$CH_3.C_6H_4.N:CS$	149.16	$1.087\frac{35}{25}$
38	**Tricetamide**	$(CH_3CO)_3N$	143.11	....
39	**Triacetin**	$(C_2H_3O_2)_3C_3H_5$	218.12	$1.1606\frac{15}{15}$
40	" (K.)	$(C_2H_3O_2)_3C_3H_5$	218.12	$1.159\frac{25}{25}$
41	**Triamino-benzene**	$1:2:3C_6H_3(NH_2)_3$	123.19	....

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	2	∞	∞	....	116.6° C.	....
2	insoluble	soluble	....	....	dec.	oily ....
3	insoluble	....	soluble	....	175°	....
4	....	....	....	....	78°	....
5	insoluble	insoluble	....	....	256–70° de.	....
6	....	v. sol. hot	v. soluble	60°	275–300°	monoclinic...
7	insoluble	∞	∞	−92.4°	111.0°	....
8	v. v. s. sol.	soluble	∞	−93.2°	110–1°	colorless.....
9	0.105^{9}	3.6^{5}	....	155°	....	octahedral...
10	0.199	7.5^{5}	....	137°	....	leaflets......
11	insoluble	....	....	....	....	oily.........
12	insoluble	....	soluble	69°	$145–6°^{15}$	rhombic.....
13	....	....	....	....	....	crystalline...
14	....	....	....	....	....	needles......
15	....	....	....	92°	$146–7°^{0}$	leaf. or pris..
16	s. soluble	v. soluble	sol. chlo.	102°	259°	long need./w.
17	1.7^{100}	v. soluble	v. soluble	110.5°	263°	prisms/w....
18	s. soluble	v. soluble	v. soluble	176–7°	275° C.	needles......
19	soluble	v. soluble	v. soluble	147°	....	needles......
20	s. soluble	....	....	97°	....	rhomb. pris..
21	s. soluble	v. soluble	s. soluble	165°	....	need.or tab./.
22	....	....	....	39°	abt. 325°	crys./et.or bz.
23	s. soluble	∞	∞	α −21°	$199.7°^{760}$	dimorphous..
24				β −15.5°		
	s. soluble	soluble	∞	....	199–200°	usually yel..
25	s. soluble	∞	∞	< −13°	203° C.	....
26	0.739^{21}	....	....	45°	200.3° C.	leaflets/al...
27	insoluble	∞	∞	....	201–4°	wh.→yel....
28	insoluble	∞	∞	....	209–11°	wh.→yel....
29	insoluble	v. soluble	v. soluble	28–9°	215–7°	wh.→yel....
30	1^{20}; 115^{100}	v. soluble	v. soluble	34°	$223°$ C.^{750}	needles......
31	5	....	soluble	< −20°	217°	....
32	v. s. sol.	v. soluble	v. soluble	58.5–9.5°	217°	needles......
33	....	....	....	....	197–9°	....
34	....	....	....	....	195–6°	....
35	....	....	....	....	200–2°	....
36	insoluble	v. soluble	∞	....	238–9°	....
37	insoluble	v. soluble	v. soluble	26–7°	242–4°	wh.→yel....
38	....	....	soluble	78–9°	....	sm. need./et.
39	s. soluble	∞	∞	....	258–9°	....
40	....	∞	∞	....	266–7° dec.	colorless ....
41	v. soluble	v. soluble	v. soluble	103°	336° C.	crystalline...

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Triamino**-benzene	1:2:4$C_6H_3(NH_2)_3$	123.19	
2	-phenol (2, 4, 6)	$OH.C_6H_2(NH_2)_3$	139.19	
3	**Triazobenzene**	$C_6H_5.N:N_2$	119.16	1.0980^{10}
4	**Tribenzylamine**	$(C_6H_5CH_2)_3N$	287.21	
5	**Tribrom**-acetic acid	$CBr_3.CO_2H$	296.89	
6	aniline (2:4:6) (K.)	$NH_2.C_6H_2.Br_3$	349.95	
7	-benzene (s.)	1:3:5$C_6H_3Br_3$	314.91	
8	" (as.)	1:3:4$C_6H_3Br_3$	314.91	
9	" (v.)	1:2:3$C_6H_3Br_3$	314.91	2.658^{16}
10	-hydrine	$CH_2Br.CHBr.CH_2Br$	280.89	2.436^{23}
11	-phenol (s.)	2:4:6$OH.C_6H_2Br_3$	330.91	
12	-resorcine (2:4:6)	$(OH)_2C_6H.Br_3$	346.91	
13	**Tributyl** amine	$(C_4H_9)_3N$	185.26	0.7782^{20}
14	**Tricarballyic** acid	$CO_2H.CH(CH_2CO_2H)_2$	176.06	
15	**Tricarboxy phenol** (1, 3, 5)	$OH.C_6H_2(CO_2H)_3+H_2O$	226.05	
16	**Trichlor**-acetal	$CHCl_2.CCl(OC_2H_5)_2$	221.44	
17	"	$CCl_3.CH(OC_2H_5)_2$	221.44	1.288
18	-acetamide	$CCl_3.CONH_2$	162.41	
19	-acetic acid	$CCl_3.CO_2H$	163.36	1.6298^{61}
20	-benzene (s.)	1:3:5$C_6H_3Cl_3$	181.38	
21	" (as.)	1:3:4$C_6H_3Cl_3$	181.38	1.4658^{10} liq.
22	" (v.)	1:2:3$C_6H_3Cl_3$	181.38	
23	benzoic acid	2:4:5$Cl_3C_6H_2.CO_2H$	225.38	
24	" "	2:3:4$Cl_3C_6H_2.CO_2H$	225.38	
25	" "	3:4:5$Cl_3C_6H_2.CO_2H$	225.38	
26	-brommethane	Cl_3CBr	198.31	2.0550^{0}_{4}
27	-ethane (1, 1, 1)	$CCl_3.CH_3$	133.38	1.3249^{26}_{4}
28	" (1, 2, 2)	$CH_2Cl.CHCl_2$	133.38	1.4784^{0}
29	-ethyl-alcohol	$CCl_3.CH_2OH$	149.38	1.5500^{23}
30	-ethylene	$CHCl:CCl_2$	131.36	
31	-hydrine	$CH_2Cl.CHCl.CH_2Cl$	147.39	1.417^{15}_{4}
32	-hydroquionone	$Cl_3C_6H(OH)_2$(2:3:5)	213.38	
33	-phenol (2:4:6)	$Cl_3C_6H_2OH$	197.38	
34	-phenol (2:3:5)	$Cl_3C_6H_2OH$	197.38	
35	-quinone	$Cl_3C_6H.O_2$	211.36	
36	**Tricosane** (n.)	$CH_3(CH_2)_{21}CH_3$	324.38	0.7799^{48}
37	**Tricyan-ethane**	$CH_3C(CN)_3$	105.15	
38	**Tridecane**	$CH_3(CH_2)_{11}CH_3$	184.24	0.7608^{15}_{4}
39	**Tridecylene**	$C_{13}H_{26}$	182.22	0.8445^{0}
40	**Triethyl** amine (k.)	$(C_2H_5)_3N$	101.16	0.7250^{25}_{25}
41	arsine	$(C_2H_5)_3As$	162.12	1.151^{17}
42	benzene (s.) 1:3:5	$C_6H_3(C_2H_5)_3$	162.15	0.8636^{17}_{4}

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	v. soluble	v. soluble	s. soluble	44°	abt. 340°	leaf./chlo . . .
2	. . . .	. . . .	. . . .	. . . .	257°	needles. . . . . .
3	insoluble	s. soluble	s. soluble	. . . .	$73.5°^{22-4}$	yellow oil. . . .
4	v. s. sol.	s. soluble	v. soluble	91.3°	. . . .	moncl.lea./al.
5	v. soluble	v. soluble	v. soluble	135°	245°	moncl. tab . .
6	insoluble	s. soluble	soluble	121–2°	. . . .	sm. needles . .
7	. . . .	s. sol. hot	. . . .	119.6°	278°	needles. . . . . .
8	. . . .	s. soluble	. . . .	44°	275–6°	needles. . . . . .
9	. . . .	. . . .	. . . .	87.4°	. . . .	monocl. pris.
10	. . . .		. . . .	16–7°	219–21°	prisms . . . . .
11	0.007^{15}	v. soluble	soluble	96°	sub.	monocl. pris.
12	v. s. sol.	v. soluble	soluble	111°	. . . .	small need. . .
13	. . . .	. . . .	. . . .	. . . .	216.5°	. . . .
14	40.52^{14}	v. soluble	s. soluble	165°	sub. dec.	rhombic. . . . .
15	0.5^{10}	v. sol. hot	s. soluble	. . . .	dec. 180°	warts . . . .
16	. . . .	soluble	. . . .	83°	230° dec.	moncl. n./al.
17	0.5	∞	∞ ; ∞ glyc.	. . . .	197°	. . . .
18	v. s. sol.	v. soluble	v. v. sol.	141°	238–9°	mncl. tab./w.
19	v. soluble	soluble	soluble	57°	195°	rhomohedral.
20	. . . .	soluble	. . . .	63.40°	$208.5°C.^{764}$	long needles.
21	. . . .	. . . .	. . . .	17°	213°	. . . .
22	. . . .	s. soluble	. . . .	53–4°	218–9°	large tab./al.
23	v. v. s. sol.	v. soluble .	. . . .	163°	sub.	sm. need./w.
24	mod. sol.	. . . .	. . . .	129°	. . . .	needles. . . . . .
25	v. v. s. sol.	v. soluble	v. soluble	203°	sub.	needles/al. . . .
26	. . . .	. . . .	. . . .	−21°	104.07° C.	. . . .
27	. . . .	. . . .	. . . .	. . . .	74.5°	. . . .
28	. . . .	. . . .	. . . .	. . . .	114°	. . . .
29	s. soluble	∞	∞	17.8°	$151°^{737}$	rhomb. tab. .
30	. . . .	. . . .	. . . .	. . . .	88°	. . . .
31	. . . .	. . . .	. . . .	. . . .	158°	. . . .
32	0.6^{15}	v soluble	v. soluble	134°	sub. leaf.	large prisms.
33	0.051^{11};	v. v. sol.	v. v. sol.	67–8°	243.5–4.5°	rhomb. pris. .
34	sol. hot	v. soluble	v. soluble	53–4°	252–3°	long need./al.
35	insoluble	s. soluble	v. soluble	165–6°	. . . .	large yel. leaf.
36	. . . .	s. soluble	soluble	47.7°	320.7°	glit. leaf./al.et
37	. . . .	v. soluble	v. soluble	93.5°	volatile	need. . . . .
38	. . . .	. . . .	. . . .	−6.2°	234°	. . . .
39	. . . .	. . . .	. . . .	. . . .	232.7° C.	. . . .
40	14.24^{20}	∞	∞	. . . .	88–9°	wh.→yel. . . .
41	insoluble	. . . .	. . . .	. . . .	$140°^{736}$ dec.	. . . .
42	. . . .	. . . .	. . . .	. . . .	217° C.	. . . .

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Triethyl** borate	$(C_2H_5)_3BO_3$	146.12	0.8863^{0}_{4}
2	boride	$(C_2H_5)_3B$	98.12	0.6961^{23}
3	carbinol	$(C_2H_5)_3COH$	116.12	0.8402^{20}
4	phosphine	$(C_2H_5)_3P$	118.12	0.812^{15}
5	phosphite	$(C_2H_5)_3PO_3$	166.12	0.9605^{17}_{0}
6	silicol	$(C_2H_5)_3SiOH$	132.53	0.8709^{0}
7	" ether	$(C_2H_5)_3SiOC_2H_5$	160.56	0.8403^{4}
8	silicon hydride	$(C_2H_5)_3SiH$	116.53	0.7510^{0}
9	" oxide	$[(C_2H_5)_3Si]_2O$	247.04	0.8590^{0}
10	**Trihydroxy**-benzene (as.)	1: 2: 4 $C_6H_3(OH)_3$	126.05	
11	-benzoic acid	2: 3: 4$(OH)_3C_6H_2CO_2H$	170.05	
12	-butane (1, 2, 3)	$CH_3.(CHOH)_2CH_2OH$	106.08	1.2324^{17}
13	-pyridine (s.)	2: 4: 6$(OH)_3C_5H_2N$	127.08	
14	**Triiodo**-acetic acid	$CI_3.CO_2H$	183.98	
15	-benzene (as.)	1: 2: 4$C_6H_3I_3$	455.94	
16	**Triisoamyl** amine (K.)	$[(CH_3)_2CH.CH_2.CH_2]_3N$	227.30	0.785^{25}_{25}
17	**Triisobutyl** amine (K.)	$[(CH_3)_2CH.CH_2]_3N$	185.26	0.766^{25}_{25}
18	**Trimellitic** acid	1: 2: 4$C_6H_3(CO_2H)_3$	210.05	
19	**Trimesic** acid (s.)	1: 3: 5$C_6H_3(CO_2H)_3$	210.05	
20	**Trimethyl** acetic acid	$(CH_3)_3C.CO_2H$	102.08	0.905^{50}
21	amine	$(CH_3)_3N$	59.11	0.662^{-5}
22	" (K.)	$(CH_3)_3N$	59.11	$0.662^{-5.2}$
23	anthracene	1: 2: 4$(CH_3)_3C_{14}H_7$	220.13	
24	"	1: 3: 6$(CH_3)_3C_{14}H_7$	220.13	
25	"	1: 4: 6$(CH_3)_3C_{14}H_7$	220.13	
26	arsine	$(CH_3)_3As$	120.07	
27	benzoic acid	2: 4: 5$(CH_3)_3C_6H_2CO_2H$	164.10	
28	bismuth	$(CH_3)_3Bi$	253.57	2.30^{18}
29	boride	$(CH_3)_3B$	56.07	1.9108
30	-butene (3) (2, 2, 3)	$(CH_3)_3C.C(CH_3): CH_2$	98.12	
31	carbinol	$(CH_3)_3C.OH$	74.08	0.7839^{24}
32	-butyl alcohol (2, 3, 3)	$(CH_3)_3C.COH(CH_3)_2$	116.13	
33	citrate	$(CH_3)_3.C_6H_5O_7$	234.12	
34	phosphate	$(CH_3)_3PO_4$	140.07	1.2195^{15}
35	phosphine	$(CH_3)_3P$	76.07	>1.
36	**Trimethylene**	$CH_2<(CH_2)_2>$	42.05	
37	bromide	$CH_2Br.CH_2.CH_2Br$	201.97	1.987^{17}_{0}
38	-carbonic acid	$<(CH_2)>CHCO_2H$	86.05	1.0879^{20}_{4}
39	-dicarbonic acid (1, 2)	$<(CH_2)_2>C<(CO_2H)_2$	130.05	
40	**Trinitro**-benzene (s.)	1: 3: 5 $C_6H_3(NO_2)_3$	213.15	
41	-cresole(1:3)(2:4:6)(K.)	$CH_3.C_6H(OH)(NO_2)_3$	243.16	
42	-cyan methane	$(NO_2)_3CCN$	176.16	

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	....	....	....	119.5°	....
2	....	soluble	soluble	....	95°	....
3	s. soluble	soluble	soluble	....	140–2°	....
4	insoluble	soluble	soluble	....	127°[744]	....
5	insoluble	v. soluble	v. soluble	....	155.5-6.5°[741]	....
6	insoluble	....	....	....	154°	....
7	insoluble	sol. H_2SO_4	....	....	153°	....
8	insoluble	....	....	....	107°	....
9	....	sol. H_2SO_4	....	....	231°	....
10	v. soluble	v. soluble	v. v. sol.	140.5°	with steam	mncl. leaf./et.
11	0.13[12]	soluble	v. soluble	d.195–200°	....	silky need./w.
12	soluble	∞	∞	....	134–6°[28]	....
13	mod. sol.	....	....	220–30°	....	micro. cryst..
14	soluble	....	....	150° dec.	....	glit. yel. leaf.
15	....	soluble	....	76°	sub.	small needles
16	insoluble	v. soluble	∞	....	237–40°	wh. → yel ...
17	insoluble	v. soluble	∞	....	189–92°	wh. → yel ...
18	mod. sol.	....	mod. sol.	228°	....	crusts.......
19	2.69[22]	v. soluble	mod. sol.	345–50°	sub. 300°+	prisms/w....
20	2.2[20]	∞	v. soluble	35.3–.5°	163.7° C..	regular......
21	v. soluble	v. soluble	soluble	....	3.2–3.8°.	....
22	v. soluble	v. soluble	soluble	....	3.2–3.8°	colorless.....
23	....	....	....	243°	....	....
24	sol. bz.	s. soluble	soluble	222°	....	....
25	sol. bz.	v. s. sol.	mod. sol.	227°	sub.	fluoresc. leaf.
26	s. soluble	....	....	....	<100°	....
27	v. s. sol. hot	v. soluble	v. soluble	149–50°	with steam	1″ need./bz..
28	....	....	....	....	110°	....
29	....	....	....	....	....	gas.........
30	....	....	....	....	78–80°	....
31	deliq. ∞	soluble	....	25.45°	82.94° C.	rhomb. tab...
32	→hydrate .	....	....	17°	131°	crystalline...
33	....	....	....	78.5–9°	283–7° dec.	triclinic.....
34	....	soluble	soluble	....	197.2° C.	....
35	insoluble	....	soluble	....	40–2°	....
36	....	....	....	−126.6°	−34°[749]	....
37	....	soluble	soluble	<−75°	165° C.	....
38	s. soluble	....	....	18–19°	182–4°	....
39	20	....	soluble	175°	210°[30]	needles/et ...
40	0.04[20]	2.95[25] abs.	v. soluble	121.2°	dec.	rh'b. tab./al.
41	v. s. sol.	soluble	soluble	105–6°	....	sm. yel. need.
42	dec.	dec.	soluble	41.5°	exp. 220°	campher.mass

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
	Trinitro-			
1	naphthaline (α)	$C_{10}H_5(NO_2)_3$ (1:3:5)	263.16	....
2	" (β)	$C_{10}H_5(NO_2)_3$ (1:3:8)	263.16	....
3	" (γ)	$C_{10}H_5(NO_3)_2$(1:4:5)	263.16	....
4	-phenol (s.)	$(NO_2)_3C_6H_2.OH$	229.15	see picric ac.
5	" (2, 3, 6)	$(NO_2)_3C_6H_2.OH$	229.15	....
6	" (3, 4, 6)	$(NO_2)_3C_6H_2.OH$	229.15	....
7	-resorcine (1:3) (2:4:6) (K.)	$(OH)_2C_6H(NO_2)_3$	245.14	....
8	-toluene (s.)	2: 4: 6$(NO_2)_3C_6H_2.CH_3$	227.16	....
9	-triphenyl methane	$(NO_2.C_6H_4)_3CH$	379.23	....
10	-xylene(1:3)(2:4:6)(K.)	$(CH_3)_2C_6H(NO_2)_3$	241.18	....
11	**Trioxymethylene** (α)	$C_3H_6O_3$	90.05	....
12	**Tripalmitin**	$C_3H_5(C_{16}H_{31}O_2)_3$	806.78	0.8657^{80}_{4}
13	**Triphenyl** acetic acid	$(C_6H_5)_3C.CO_2H$	288.13	....
14	amine	$(C_6H_5)_3N$	245.16	0.774^{0}_{0}
15	benzene (s.)	1: 3: 5$C_6H_3(C_6H_5)_3$	306.15	1.2055
16	carbinol	$(C_6H_5)_3COH$	260.13	....
17	ethane (s.)	$C_6H_5.CH_2.CH(C_6H_5)_2$	258.15	....
18	guanidine (α)	$C_6H_5.N: C(NHC_6H_5)_2$	287.26	....
19	" (β)	$HN: C(NHC_6H_5)N(C_6H_5)_2$	287.26	....
20	hydrazine	$(C_6H_5)_2N.NHC_6H_5$	263.21	....
21	methane	$(C_6H_5)_3CH$	244.13	1.0568^{95}_{95}
22	methyl	$(C_6H_5)_3C$?	243.12	....
23	phosphine	$(C_6H_5)_3P$	262.12	1.194
24	**Tripropyl amine** (K.)	$(CH_3.CH_2.CH_2)_3N$	143.21	0.750^{25}_{25}
25	**Tristearin**	$C_3H_5(C_{18}H_{35}O_2)_3$	826.88	0.8621^{80}_{4}
26	**Trithio-aldehyde**	$(CH_3CSH)_3$	180.28	....
27	" (a.)	$(CH_3CSH)_3$	180.28	....
28	-carbonic acid	$CS(SH)_2$	110.20	....
29	-glycerine	$CH_2SH.CHSH.CH_2SH$	140.24	1.391^{14}
30	**Tyrosin**	$OH.C_6H_4.C_2H_3(NH_2)CO_2H$	181.18	1.456
31	**Undecane** (n.)	$CH_3(CH_2)_9CH_3$	156.20	0.7581^{20}
32	**Undecylene**	$C_{11}H_{22}$	154.18	0.7729^{20}
33	**Undecyclic acid**	$CH_3(CH_2)_9CO_2H$	186.18	....
34	**Uramil** (murexan)	$CO<(NH.CO)_2>CHNH_2$	143.16	....
35	**Urea**	$CO(NH_2)_2$	60.11	1.323
36	nitrate	$CO(NH_2)_2.HNO_3$	123.16	....
37	**Urethane**	$NH_2CO_2.C_2H_5$	89.10	0.9862^{21}
38	**Uric acid**	$C_5H_4N_4O_3$	168.19	1.855–1.893
39	**Usnic acid** (d)	$C_{18}H_{16}O_7$	344.13	....
40	**Usnic acid** (i)	$C_{18}H_{16}O_7$	344.13	....

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	v. sol. acet.	v. soluble	v. sol. chlo.	122°	....	monoclinic...
2	v.s.sol.chlo.	0.046^{23}88%	v. s. sol.	218°	....	monocl./chol.
3	0.64 chlo.	0.122^{18}90%	0.39	154°	....	glit. yel. leaf.
4	....	....	....	....	....	....
5	mod.sol.hot	v. soluble	v. soluble	117–8°	....	small need...
6	mod.sol.hot	v. soluble	v. soluble	96°	....	glt.n.or scales
7	v. s. soluble	soluble	s. soluble	174–5°	....	sm. yel. pr...
8	0.386^{17} CS_2	v. sol. hot	....	82°	....	rhombic.....
9	sol. bz.	....	v. s. sol.	206–7°	....	cryst./bz.....
10	insoluble	soluble	s. soluble	180–1°	....	yel. prisms ..
11	soluble	soluble	soluble	60–1°	sub.	needles......
12	....	0.0043^{21abs}	v. soluble	65.5°	310–20°^{0}	irreg. cryst...
13	s. soluble	mod. sol.	s. soluble	2.64–5°	....	monocl. pris.
14	mod. sol.bz	s. soluble	sol. acet.	127°	347–8°	mncl. pris./et
15	sol. bz.	s. soluble	s. soluble	169–70°	dist.	rhb. tab./et..
16	sol. bz.	v. soluble	v. soluble	162°	360°+	hexag./bz ...
17	....	insoluble	v. soluble	54°	348–9° C.	monocl. leaf..
18	insoluble	7.94^{25} abs.	....	144–4.5°	dec.	rhb. pris./al .
19	v. s. sol.	v. soluble	v. soluble	131°	....	regular tab...
20	mod. sol.	mod. sol.	s. soluble	142°	....	thick needles
21	sol. bz. hot	s. soluble	v. soluble	92°	358–9°^{754}	rhombic.....
22	v. sol. chlo.	v. s. sol.	v. s. sol.	145–7°	....	transp. cryst.
23	insoluble	mod. sol.	v. soluble	79°	>360°	mncl. prs./et.
24	s. soluble	∞	soluble	....	154.5–6.5°	colorless.....
25	....	v. s. sol.	....	71.6°	dist. in vac.	cryst........
26	insoluble	4.87^{25}	21.70^{25}	45–6°	205°	rhomb. need.
27	....	....	....	α101° β125	246–7°	long prisms..
28	insol. dec.	sol. Na_2CO_3	soluble	[γ 76°	57° dec.	led. brown oil
29	insoluble	mod. sol.	insoluble	....	....	....
30	0.04^{20}	0.01^{17}	insoluble	314–8° C.	....	silky needles .
31	....	....	....	−25.6°	194.5° C.	....
32	....	....	....	....	195.4° C.	....
33	insoluble	v. soluble	....	28.5°	212.5°^{100}	scales.......
34	insoluble	sol. NH_3	sol.con. HCl	....	....	needles. .....
35	100; sol. bz.	5.06	s. soluble	132.65° C.	dec.	quadratic....
36	s. soluble	s. soluble	....	163°	....	monoclinic...
37	v. soluble	v. soluble	v. soluble	49–50°	180°	leaflets......
38	0.007	insoluble	insoluble	dec.	dec.	scales ....
39	insoluble	v. s. sol.	s. soluble	203°	dec.	yel. pris./al ..
40	insoluble	v. s. sol.	0.3^{20}	192–3°	....	yel. mon. pris.

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	**Uvic acid** (2:5) (3)	$(CH_3)_2C_4HO.CO_2H$	140.06	
2	**Uvitic acid** 1: 3: 5	$CH_3.C_6H_3(CO_2H)_2$	180.06	
3	**Valeric acid** (n.)	$CH_3(CH_2)_3CO_2H$	102.08	0.9415^{20}
4	" " (n.) (K.)	$CH_3(CH_2)_3CO_2H$	102.08	0.937^{25}_{25}
5	aldehyde	$CH_3(CH_2)_3CHO$	86.08	0.8185^{11}
6	anhydride	$(C_5H_9O)_2O$	186.15	0.927^{27}_{4}
7	**Valerylene**	$CH_3.C\vdots C.CH_2.CH_3$	68.06	
8	**Valylene**	$CH_2: C.(CH_3).C\vdots CH$	66.05	
9	**Vanillic acid** 3: 4: 1	$CH_3O.C_6H_3(OH)CO_2H$	168.06	
10	alcohol 3: 4: 1	$CH_3O.C_6H_3(OH)CH_2OH$	154.08	
11	**Vanilline** 3: 4: 1	$CH_3O.C_6H_3(OH)CHO$	152.06	
12	**Veratrol** (K.)	$C_6H_4(OCH_3)_2$	138.08	1.084^{25}_{25}
13	**Veronal**	$(C_2H_5)_2C<(CONH)_2>CO$	160.18	
14	**Vesuvine** impure	$C_{18}H_{18}N_8)+\frac{2}{3}C_6H_6$	398.50	
15	**Vinyl acetic acid**	$CH_2: CH.CH_2CO_2H$	86.05	
16	amine	$(.CH_2.)_2>NH$	43.08	0.8321^{24}
17	bromide	$CH_2: CHBr$	106.99	1.5167^{14}
18	chloride	$CH_2: CHCl$	62.48	
19	ether	$(CH_2: CH)_2O$	70.05	
20	ethyl carbinol	$C_2H_3.CH(OH).C_2H_5$	86.08	0.840^{20}_{4}
21	" ether	$C_2H_3.O.C_2H_5$	72.06	0.7625^{14}_{17}
22	sulphide	$(CH_2: CH_2)_2S$	86.11	0.9125
23	**Wood alcohol**	(see methyl alcohol)		
24	**Xanthene**	$CH_2<(C_6H_4)_2>O$	182.08	
25	**Xanthine** (2:6)	$C_5H_2N_4(OH)_2$	152.19	
26	**Xanthone**	$CO<(C_6H_4)_2>O$	196.06	
27	**Xylene** (o.)	$C_6H_4(CH_3)_2$	106.08	0.8818^{15}_{15}
28	" " (K.)	$C_6H_4(CH_3)_2$	106.08	0.876^{25}_{25}
29	" (m.)	$C_6H_4(CH_3)_2$	106.08	0.8691^{15}_{15}
30	" " (K.)	$C_6H_4(CH_3)_2$	106.08	0.863^{25}_{25}
31	" (p.)	$C_6H_4(CH_3)_2$	106.08	0.8661^{15}_{15}
32	" " (K.)	$C_6H_4(CH_3)_2$	106.08	0.859^{25}_{25}
33	" " com'l pure (K.)	$C_6H_4(CH_3)_2$	106.08	0.861^{25}_{25}
34	sulphonic ac. (4) (1, 2)	$(CH_3)_2C_6H_3.SO_3H+2H_2O$	222.18	
35	**Xylenol** (1, 2) (3)	$(CH_3)_2C_6H_3OH$	122.08	
36	" (1, 2) (4)	$(CH_3)_2C_6H_3OH$	122.08	
37	" (1, 3) (2)	$(CH_3)_2C_6H_3OH$	122.08	
38	" (1, 4) (4)	$(CH_3)_2C_6H_3OH$	122.08	$.0362^{0}$
39	" (1, 3) (5)	$(CH_3)_2C_6H_3OH$	122.08	
40	" (1, 4) (2)	$(CH_3)_2C_6H_3OH$	122.08	1.169^{15}
41	**Xylidine** (1: 2) (3)	$(CH_3)_2C_6H_3.NH_2$	121.13	0.991^{15}
42	" (1: 2) (4)	$(CH_2)_2C_6H_3.NH_2$	121.13	1.0755^{17}

Number.	Solubility in 100 c.c. Water (w.).	Alcohol (al.).	Ether (et.).	Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
1	0.25^{100}	v. soluble	v. v. sol.	135°	with steam	needles/w...
2	insoluble	v. soluble	v. soluble	290–1°	sub.	fine need./w .
3	3.7^{16}	∞	∞	−58.5°	186.4° C.	....
4	3.7 c.c.^{16}	∞	∞	−59°	185.5–6.5°	colorless.....
5	s. soluble	....	....	....	103.4°	....
6	insoluble	....	....	....	215°	....
7	....	....	....	....	55.5–6°	....
8	....	....	....	....	50°	....
9	0.12^{14}	v. soluble	soluble	207°	sub.	needles/w...
10	v. sol. hot	v. soluble	v. soluble	115°	dec.	prisms......
11	1.0^{14}; 5^{80}	v. soluble	v. soluble	80–1°	285° in CO_2	monel. n./w..
12	s. soluble	soluble	soluble	23°	207.1° C.	cryst........
13	0.7^{20}, 8^{100}	soluble	v. soluble	182°	....	cryst. pw....
14	s. sol. hot	v. soluble	v. soluble	118°	....	cryst./bz....
15	....	....	....	< −20°	168°, $70^{\circ 12}$	....
16	∞	soluble	....	....	56°	....
17	....	....	....	....	$16^{\circ 750}$	....
18	....	soluble	....	....	−18–15°	....
19	....	soluble	∞	....	39°	....
20	....	....	....	....	114–4.5°	....
21	s. soluble	∞	∞	....	35.5°	....
22	s. soluble	∞	∞	....	101°	oily.........
23	....	....	....	....	....	....
24	v. s. soluble	s. soluble	soluble	100.5°	315° C.	leaflets/al ...
25	0.26^{17}	0.033^{17}	v.sol.KOH	....	sub. pt.dec.	powder......
26	insoluble	0.7	s. soluble	173–4°	350–1°	long need/al.
27	insoluble	v. soluble	v. soluble	−27.1°	142.6° C.	....
28	insoluble	soluble	∞	−29°	142–3°	colorless.....
29	insoluble	v. soluble	v. soluble	−54.8°	139.3° C.	....
30	insoluble	soluble	∞	−54°	138.5–9.5°	colorless.....
31	insoluble	v. soluble	v. soluble	15°	137.5° C.	monel. prisms
32	insoluble	soluble	∞	15°	137–7.5°	monel. prisms
33	insoluble	soluble	∞	....	....	....
34	soluble	....	....	dec.	....	rectang. tab..
35	soluble	soluble	....	75°	218° C.	long need./w.
36	soluble	soluble	....	65°	$225^{\circ 767}$	long need./w.
37	s. sol. hot	soluble	....	49°	211–2°	leaflets......
38	v. s. sol.	∞	∞	26°	211.5° C.	needles......
39	s. soluble	soluble	sol. NaOH	68° or 64°	219.5°	fine need./w.
40	soluble	soluble	....	74.5°	211.5°	monocl. pris..
41	....	....	....	< −15°	225°	....
42	s. soluble	mod.sol.lig	....	49°	226°	monel. tab...

Number.	Name.	Formula.	Molecular Weight.	Specific Gravity. Water = 1. Air = 1 (A).
1	Xylidine 1: 3: 2	$(CH_3)_2C_6H_3.NH_2$	121.13	
2	" 1: 3: 4	$(CH_3)_2C_6H_3.NH_2$	121.13	0.9184^{15}
3	" 1: 3: 5	$(CH_3)_2C_6H_3.NH_2$	121.13	0.9935^{0}
4	" 1: 4: 2	$(CH_3)_2C_6H_3.NH_2$	121.13	0.980^{15}
5	Xylose (l.)	$C_5H_{10}O_5$	150.08	1.535^{0}
6	Zinc ethyl	$Zn(C_2H_5)_2$	123.48	1.182^{18}
7	methyl	$Zn(CH_3)_2$	95 45	1386^{10}

Number.	Solubility in 100 c.c.			Melting Point, °C. C. = Corrected.	Boiling Point, °C. C. = Corrected.	Crystalline Form and Color.
	Water (w.).	Alcohol (al.).	Ether (et.).			
1	....	....	....	....	216°	....
2	....	....	....	....	212°	....
3	....	....	....	....	220–1.°	....
4	....	....	....	15.5°	$215^{\circ 739}$	....
5	117^{20}	v. v. s. sol.	v. v. s. sol.	150–3°	....	orthorhomb
6	dec.	dec.	soluble	−28°	118°	....
7	dec.	....	....	−40°	46°	....

XXXI

PHYSICAL CONSTANTS OF ALKALOIDS

Compiled by Atherton Seidell

EXPLANATORY REMARKS

This table was compiled from the data found in the United States Pharmacopœia, 8th Revision (1905); Beilstein's "Handbuch der Organ. Chemie," 3rd Edition (1896–1899), and Ergänzungsbände thereto (1901–1906). Merck's 1907 Index; Hager's "Handbuch der Pharmaceutischen Praxis" (1900); Bruhl's "Die Pflanzen Alkaloide" (1900); and Pictet's "The Vegetable Alkaloids" — translated and revised by H. C. Biddle (1904).

No attempt has been made to include every alkaloidal compound mentioned in the above-named reference books, but those only have been selected which appear of most general interest and for which the constants have been most completely determined.

The solubility data are for the most part of qualitative reliability only. The quantitative statements found in the reference books vary considerably, especially so in the case of alcohol as the solvent. In fact it is practically hopeless to harmonize them in a reasonably satisfactory manner. In the present table an attempt has been made in all cases to select a value from the available sources which is nearest the truth, giving preference, however, to the U. S. P. results. It may also be mentioned that in practically all reference books the solubilities are expressed in terms of parts of solvent to dissolve one part of alkaloid. It is often uncertain whether weight or volume parts are meant, and furthermore the temperature is frequently omitted, as well as the degree of purity or strength of the solvent employed. For greater uniformity and convenience, the solubility values have been recalculated to terms of weight of alkaloid dissolved in 100 grams of the solvent. Unless otherwise stated, it is to be understood that the compounds are colorless.

Sol. = soluble, v. = very, sl. = slightly, insol. = insoluble.

The compiler of this table desires to acknowledge his indebtedness to Professors W. A. Puckner and H. M. Gordin for valuable criticisms and suggestions.

XXXI.—PHYSICAL CON-

BY ATHERTON

Number.	Name.	Formula.	Molecular Weight.	Melting Point.
1	**Aconitine**	$C_{34}H_{47}NO_{11}$ (or $C_{33}H_{45}NO_{12}$)	645.386	195° (1)
2	hydrobromide	$C_{34}H_{47}NO_{11}.HBr+2.5H_2O$	771.354	163° (4)
3	hydrochloride	$C_{34}H_{47}NO_{11}.HCl+3H_2O$(3)	735.902	....
4	nitrate	$C_{34}H_{47}NO_{11}.HNO_3+5.5H_2O$	798.484	....
5	sulphate	$(C_{34}H_{47}NO_{11})_2.H_2SO_4$	1388.858	....
6	**Anhalonidine**	$C_{12}H_{15}NO_3$	221.13	154° (5)
7	**Anhalonine**	$C_{12}H_{15}NO_3$	221.13	85.5°
8	**Anhydroecgonine**	$C_9H_{13}NO_2$	167.110	235° (6)
9	hydrochloride	$C_9H_{13}NO_2.HCl$	203.582	240°
10	**Apoatropine**	$C_{17}H_{21}NO_2$	271.178	60°–62°
11	hydrochloride	$C_{17}H_{21}NO_2.HCl$	307.646	237°–9°
12	**Apocodeine**	$C_{18}H_{19}NO_2$	281.162	....
13	**Apomorphine**	$C_{17}H_{17}NO_2$	267.146	....
14	hydrochloride	$C_{17}H_{17}NO_2.HCl$	303.614	200°–10° (6)
15	**Arecoline** hydrobromide	$C_8H_{13}NO_2.HBr$	236.042	167°–8°
16	**Atropine** (Daturine)	$C_{17}H_{23}NO_3$	289.194	115°
17	gold hydrochloride	$(C_{17}H_{23}NO_3.HCl)AuCl_3$	629.242	135°–7°
18	iodate	$C_{17}H_{23}NO_3IO_3H$	465.122	....
19	sulphate	$(C_{17}H_{23}NO_3)_2.H_2SO_4$(12)	676.474	183°–184°.5 (4) (7)
20	valerate	$(C_{17}H_{23}NO_3.C_5H_{10}O_2).H_2O$	409.22	42°
21	**Bebeerine** (Bebirine)	$C_{18}H_{21}NO_3$	299.178	214° (8)
22	hydrochloride	$C_{18}H_{21}NO_3.HCl$	335.646	259°
23	**Berberine**	$C_{20}H_{17}NO_4+6H_2O$	443.242	145° (4)
24	hydrochloride	$C_{20}H_{17}NO_4.HCl+4H_2O$(11)	443.678	....
25	bisulphate	$C_{23}H_{17}NO_4.H_2SO_4$	431.232	....
26	**Brucine**	$C_{23}H_{26}N_2O_4+4H_2O$(11)	466.292	105° (9)
27	hydrochloride	$C_{23}H_{26}N_2O_4.HCl$	430.696	....
28	nitrate	$C_{23}H_{26}N_2O_4.HNO_3.2H_2O$	493.278	230° (6)
29	sulphate	$(C_{22}H_{26}N_2O_4)_2H_2SO_4.7H_2O$	1012.654	....

(1) With slow heating at 182° with decomposition.
(2) 3% solution in alcohol.
(3a) In 2% aq. solution. (3) Or 3.5 H_2O.
(4) Of the anhydrous salt.
(5) 159° according to Beilstein.
(6) With decomposition.

STANTS OF ALKALOIDS

SEIDELL

Number.	Solubility at 25°. Grams per 100 Grams: H₂O.			Optical Activity.	Crystalline Form, Color, Etc.
	H_2O.	C_2H_5OH. (92.3 wt. %).	$(C_2H_5)_2O$.		
1	0.0312	4.54	2.27	$[\alpha]_D^{23} = +11°$ (2)	rhombic tables or prisms; also amorphous.
2	soluble	soluble	....	$[\alpha]_D = -30.47°$ (3a)	monoclinic tables.
3	soluble	soluble	....	lævo	....
4	soluble	soluble	....	lævo	....
5	soluble	soluble	....	lævo	....
6	soluble	soluble	soluble	inactive	needles, octohedra.
7	....	soluble	soluble	....	needles.
8	v. soluble	soluble	v. sl. sol.	....	crystals.
9	soluble	soluble	....	$[\alpha]_D = -61.5°$	needles, rhombic, hemimorphic.
10	sl. soluble	v. soluble	v. soluble	....	prisms.
11	soluble	....	....	....	leaflets.
12	v. sl. sol.	soluble	soluble	....	amorphous, gummy mass.
13	sl. soluble	soluble	soluble	....	amorphous mass, turns green in air.
14	2.53	2.62	0.0536	....	monoclinic prisms.
15	soluble	soluble	....	....	prisms.
16	0.22	68.5	6.0	inactive	rhombic prisms or needles (sublimes).
17	sl. soluble	....	....	....	crystals, leaflets or glistening powder.
18	....	....	....	....	....
19	263	27	0.0467	inactive	powder or needles.
20	v. soluble	sl. soluble	sl. soluble	....	crystal crusts.
21	0.016 (cold)	v. soluble	....	$[\alpha]_D = -298°$	glistening prisms.
22	v. soluble	v. soluble	....	....	needle clusters (hygroscopic).
23	22.2 (21°)	1.0 (cold)	v. sl. sol.	inactive	red-yellow needles or prisms.
24	soluble	soluble	....	....	bright orange needles.
25	1.0 (21°)	sl. soluble	....	....	fine yellow crystals.
26	0.31 (cold)	v. soluble	v. sl. sol.	$[\alpha]_D = -119°$ $-127°$ (10)	monoclinic columns, plates, prisms or leaflets.
27	v. soluble	....	....	....	crystalline clusters.
28	soluble	soluble	....	....	four-sided prisms.
29	....	....	....	....	long needles.

(7) At about 189.9° (U. S. P.)
(8) At 180° when amorphous.
(9) At 178° when anhydrous.
(10) In chloroform solution.
(11) Also with $.2H_2O$.
(12) Also with $.1\ H_2O$.

Number.	Name.	Formula.	Molecular Weight.	Melting Point.
1	**Bulbocapnine**	$C_{19}H_{19}NO_4$	325.162	199°
2	**Caffeine** (tri methyl xanthine).	$C_8H_{10}N_4O_2+H_2O$(1)	212.136	236.8° (2)
3	citrate	$C_8H_{10}N_4O_2.C_6H_8O_7$	386.184	...
4	hydrochloride	$C_8H_{10}N_4O_2.HCl+2H_2O$(3)	266.620	...
5	sulphate	$C_8H_{10}N_4O_2.H_2SO_4$(4)	292.206	...
6	tri iodide	$C_8H_{10}N_4O_2I_2.HI+1.5H_2O$	592.912	171° (21)
7	valerate (iso)	$C_8H_{10}N_4O_2.C_6H_{10}O_2$	296.20	...
8	**Carpaine**	$C_{14}H_{25}NO_2$	239.21	121° (cor.)
9	hydrochloride	$C_{14}H_{25}NO_2.HCl$	275.678	225° (7)
10	**Chelerythrine**	$C_{19}H_{11}NO_2(OCH_3)_2$	347.146	203°–4°
11	**Chelidonine**	$C_{20}H_{19}NO_5+H_2O$	371.183	135°–6°
12	hydrochloride	$C_{20}H_{19}NO_5.HCl$	389.634	...
13	**Cinchonidine**	$C_{19}H_{22}N_2O$	294.196	207.2° (cor.)
14	hydrochloride	$C_{19}H_{22}N_2O.HCl+H_2O$(11).	348.68	...
15	bisulphate	$C_{19}H_{22}N_2O.H_2SO_4+5H_2O$	482.362	...
16	sulphate	$(C_{19}H_{22}N_2O)_2.H_2SO_4+3H_2O$(12).	740.526	205.3° (13)
17	**Cinchonine**	$C_{19}H_{22}N_2O$	294.196	264.3° (cor.)
18	hydrochloride	$C_{19}H_{22}N_2O.HCl+2H_2O$	366.696	...
19	nitrate	$C_{19}H_{22}N_2O.HNO_3+\frac{1}{2}H_2O$	366.222	...
20	bisulphate	$C_{19}H_{22}N_2O.H_2SO_4+4H_2O$	464.346	...
21	sulphate	$(C_{19}H_{22}N_2O)_2.H_2SO_4+2H_2O$(19).	722.510	198.5°

(1) Anhydrous when crystallized from alcohol.
(2) When dried at 100° to constant weight.
(3) Also anhydrous, Beilstein.
(4) Also with .1 H_2O.
(5) With decomposition.
(6) In absolute alcohol.
(7) Begins to darken and decompose at higher temperature.
(8) In 96% alcohol, $p = 2$.
(9) For a solu. in a mixture of 2 vols. $CHCl_3$ and 1 vol. C_2H_5OH of 97%, $p = 1.1 - 2.1$.
(10) Grams per 100 cc. of saturated solution in 99.75 vol., per cent alcohol.
(11) Also with .2 H_2O.

Number.	Solubility at 25°. Grams per 100 Grams: H₂O.			Optical Activity.	Crystalline Form, Color, Etc.
	H_2O.	C_2H_5OH (92.3 wt. %).	$(C_2H_5)_2O$.		
1	insoluble	soluble	soluble	$[\alpha]D = +$ 237.1°	rhombic hemihedral prisms.
2	2.19	1.88	0.267	....	flexible silky needles (sublimes).
3	soluble	soluble	....	....	monoclinic crystals.
4	soluble (5)	....	....	....	monoclinic crystals.
5	soluble (5)	....	....	....	rosettes of needles.
6	soluble (5)	v. soluble	....	....	long metal green prisms
7	soluble (5)	....	....	....	fatty glistening needles
8	insoluble	11 (12°) (6)	3	$[\alpha]D = +$ 21° 55′ (6)	monoclinic prisms, rhombic crystals (sublimes).
9	11.6	....	....	....	long needles, rhombic or monoclinic.
10	....	sl. soluble	sl. soluble	inactive	rhombohedral crystals (solutions fluoresce blue).
11	insoluble	soluble	soluble	$[\alpha]D^{20} = +$ 115° 24′ (8)	monoclinic tables or powder (tribolu-minescence in sol.)
12	0.31 (18°)	....	....	....	fine crystals.
13	0.019 (11.5°)	6.13 (13°)	0.53 (15°)	$[\alpha]D^{17.8°} = -$ 107.9° (9)	large trimetric prisms.
14	5 (20°)	25.55 (18.5°) (10)	....	lævo	large double trimetric pyramids, mono-clinic.
15	v. soluble	v. soluble	....	lævo	long monoclinic prisms
16	1.6	1.4	0.0237	lævo	glistening needles or prisms.
17	0.043	0.795 (20°) (15)	0.27 (10°) (16)	$[\alpha]D^{17} = +$ 229.6 (14)	monoclinic tables, columns, prisms or needles (sublimes).
18	4.5 (cold)	100 (cold)	0.18 (cold)	$[\alpha]D = +$ 165.5 (17)	monoclinic crystals.
19	3.79 (12°)	soluble	....	dextro	monoclinic crystals.
20	217 (14°)	111 (14°) (18)	....	....	rhombic octohedral.
21	1.72	10	0.043	$[\alpha]D = +$ 170.3 (20)	prismatic, rhombic monoclinic.

(12) Also with .6 H_2O.
(13) Darkens at 203°, U. S. P.
(14) In absolute alcohol, $p = 0.1875$.
(15) In 84 vol. per cent alcohol.
(16) In ether of $d = 0.73$.
(17) 2.425 p in aq. solution.
(18) In alcohol of $d = 0.85$.
(19) Also .1 H_2O.
(20) 0.855 p in aq. solution.
(21) For anhydrous salt.

Number.	Name.	Formula.	Molecular Weight.	Melting Point.
1	**Cinchotine**	$C_{19}H_{24}N_2O$	296.212	265°–278° (cor.)
2	**Cocaine**	$C_{17}H_{21}NO_4$	303.178	98°
3	hydrochloride	$C_{17}H_{21}NO_4.HCl$	339.646	189.9°
4	**Codeine**	$C_{18}H_{21}NO_3+H_2O$	317.194	154.9° (4)
5	hydrochloride	$C_{18}H_{21}NO_3.HCl+2H_2O$	371.678	264° (4)
6	phosphate	$C_{18}H_{21}NO_3.H_3PO_4+2H_2O$ (6).	433.280	235°
7	sulphate	$(C_{18}H_{21}NO_3)_2.H_2SO_4+5H_2O$.	786.522	278° (7)
8	**Colchicine**	$C_{22}H_{25}NO_6$	399.21	142.5 (8)
9	**Conhydrine** (oxyconiine)	$C_8H_{17}NO$	143.146	120.6
10	(pseudo)	$C_8H_{17}NO$	143.146	101–2
11	**Coniine** (*d*-2-propyl piperidine).	$C_8H_{17}N$	127.146	−2.5° (10)
12	hydrochloride	$C_8H_{17}N.HCl$	163.624	208°–210°
13	**Cryptopine**	$C_{21}H_{23}NO_5$	369.194	217°
14	**Cytisine** (Ulexine)	$C_{11}H_{14}N_2O$	190.132	152°–3°
15	**Delphinine**	$C_{22}H_{35}NO_6$(13)	409.29	120° (14)
16	**Diacetyl morphine** (Heroin).	$C_{21}H_{23}NO_5$	369.194	171°, 173°
17	hydrochloride.	$C_{21}H_{23}NO_5.HCl$	405.662	230°–231°

(1) In absolute alcohol, $p=0.625$.
(2) In chloroform solution, q = per cent $CHCl_3$.
(3) In alcohol solution, q = % C_2H_5OH.
(4) For anhydrous salt.
(5) In 97% alcohol.
(6) Also with 1.5 H_2O.
(7) Chars at 200° and residue melts at 278°.
(8) When dried over H_2SO_4.

Number.	Solubility at 25°. Grams per 100 Grams:			Optical Activity.	Crystalline Form, Color, Etc.
	H_2O.	C_2H_5OH (92.3 wt. %).	$(C_2H_5)_2O$.		
1	....	....	insoluble	$[\alpha]D^{17}=+199$ (1)	needles from alcohol.
2	0.166	20	26.3	$[\alpha]D^{20}=-(15.827+.00585\,q)$ (2)	four or six-sided monoclinic prisms.
3	250	38.4	insoluble	$[\alpha]D^{20}=-(52.18+0.1588\,q)$ (3)	monoclinic prisms, leaflets or powder.
4	0.83	62.5	8	$\alpha j=-135.8°$ (5)	orthorhombic prisms, octohedral crystals or crystalline powder.
5	4 (15°)	....	....		short needles.
6	44.9	0.383	0.0746	$[\alpha]D$ for neutral salts $=-134°$	needle shaped crystals, or powder.
7	3.3	0.0967	insoluble		rhombic prisms, needle shaped crystals or powder.
8	4.54	v. soluble	0.645	lævo	pale yellow leaflets or powder.
9	soluble	soluble	soluble	dextro	leaflets (sublimes), b. pt. 225°.
10	soluble	soluble	soluble	$[\alpha]D=+4.30°$ (9)	needle shaped crystals (sublimes), b.pt. 229°.
11	1.1	all proportions	ca. 16	$[\alpha]D^{19}=+16.4°$	oily liquid, $d_{19}=0.844$, b. pt. (739 mm.) 163.5° in hydrogen.
12	50	soluble	insoluble	....	large rhombic crystals.
13	insoluble	v. sl. sol.	insoluble	inactive	microscopic six-sided prisms or plates.
14	78 (16°)	30.1 (8°) (11)	insoluble	$[\alpha]D^{17}=-119.1°$ (12)	rhombic hemihedral crystals (sublimes to needles and leaflets).
15	0.002 (20°)	4.8 (20°) (15)	9. (20°)	inactive	rhombic crystals, plates.
16	v. sl. sol.	sl. soluble	sl. soluble	....	prisms or powder.
17	50	soluble	insoluble	....	crystalline powder.

(9) In 8% solution.
(10) Solidifying point.
(11) In absolute alcohol.
(12) In 2% aq. solution; – 111°, 22′ for 5% aq. solution.
(13) $C_{31}H_{49}NO_7$ (Brühl).
(14) Decomposes without melting.
(15) In 98% alcohol.

Number.	Name.	Formula.	Molecular Weight.	Melting Point.
1	**Dionin** (ethyl morphine hydrochloride).	$C_{19}H_{23}NO_3.HCl+2H_2O$ (1)	385.694	125° (2)
2	**Ditaine** (Echitamine) . . .	$C_{22}H_{28}N_2O_4+4H_2O$(3). . . .	456.308	206° (4)
3	**Ecgonine**	$C_9H_{15}NO_3+H_2O$	203.146	198° (6)
4	hydrochloride	$C_9H_{15}NO_3.HCl$	239.614	246°
5	**Emetine**	$C_{30}H_{40}N_2O_5$	508.34	62°–65° (8)
6	**Ephedrine**	$C_{10}H_{15}NO$	165.13	. . . .
7	**Ergotinine**	$C_{35}H_{40}N_4O_6$	612.36	205° (9)
8	α **Eucaine**	$C_{19}H_{27}NO_4$	333.226	103°–5°
9	hydrochloride	$C_{19}H_{27}NO_4.HCl+H_2O$	387.71	ca. 200° (2)
10	β **Eucaine**	$C_{15}H_{21}NO_2$	253.178	ca. 78°, 91°
11	hydrochloride	$C_{15}H_{21}NO_2.HCl$	289.646	268° (2)
12	**Gelseminine**	$C_{22}H_{26}N_2O_3$	366.228	172° (11)
13	hydrochloride	$C_{22}H_{26}N_2O_3.HCl$	407.696	330° (12)
14	**Homoatropine** (oxytoluylatropeine).	$C_{16}H_{21}NO_3$	275.178	95.5°–98.5°
15	hydrobromide	$C_{16}H_{21}NO_3.HBr$	356.106	213.8°
16	**Hydrastine**	$C_{21}H_{21}NO_6$	383.178	131°
17	hydrochloride	$C_{21}H_{21}NO_6.HCl+aq$	419.646	. . . .
18	**Hydrastinine**	$C_{11}H_{13}NO_3$	207.114	116°–7°
19	hydrochloride	$C_{11}H_{11}NO_2.HCl$	225.566	212° (2)
20	bisulphate	$C_{11}H_{11}NO_2.H_2SO_4$	287.184	216° (2)
21	**Hydroberberine**	$C_{20}H_{21}NO_4$	339.178	167°
22	**Hydrocotarnine**	$C_{12}H_{15}NO_3+\frac{1}{2}H_2O$	230.138	50°, 55°
23	**Hydrohydrastinine**	$C_{11}H_{13}NO_2$	191.114	66°
24	**Hyoscine** (Scopolamine).	$C_{17}H_{21}NO_4$	303.178	ca. 50°, 59°

(1) .1 H_2O also given.
(2) With decomposition.
(3) Also .1 H_2O, dehydrates at 105°.
(4) With rapid heating, decomposes.
(5) For 2% solution in 97% alcohol.
(6) At 205° after drying at 140°.
(7) In 95% alcohol.
(8) Also given as 68°.

Number.	Solubility at 25°. Grams per 100 Grams: H_2O.	C_2H_5OH (92.3 wt. %).	$(C_2H_5)_2O$.	Optical Activity.	Crystalline Form, Color, Etc.
1	14.3	50	insoluble	....	microscopically crystalline powder.
2	soluble	v. soluble	sl. soluble	$[\alpha]_D^{15}=-28.8°$ (5)	thick glistening prisms
3	21.7 (17°)	1.83(17°) (7)	v. sl. sol.	lævo	monoclinic prisms (from abs. alcohol).
4	soluble	sl. soluble	....	$[\alpha]_D=-57$	triclinic plates.
5	0.1	v. soluble	v. soluble	inactive	leaflets.
6	soluble	soluble	soluble	....	crystalline mass, b. pt. 225°. (Brühl)
7	insoluble	0.5 (20°) (7)	soluble	$[\alpha]_D=+335°$ (10)	prismatic needles (solutions fluoresce violet)
8	....	....	v. soluble	....	shining prisms, crystals.
9	10	117	sl. soluble	....	rosettes of small crystals or powder.
10	....	....	v. soluble	....	crystals.
11	3–5	11	insoluble	....	plates and prisms or powder.
12	insoluble	....	....	....	rosettes from benzene, also amorphous.
13	v. soluble	v. sl. sol.	....	....	microscopic columns or prisms.
14	sl. soluble	....	....	....	glistening prisms from alcohol.
15	17.5	3.08	insoluble	....	rhombic prisms.
16	v. sl. sol.	0.75	0.80	$[\alpha]_D^{17}=-678°$ (13)	rhombic prisms; trimetric.
17	soluble	....	soluble	lævo	microcrystalline powder.
18	sl. soluble	v. soluble	v. soluble	inactive	needles (from ligroin).
19	v. soluble	v. soluble	0.77	inactive	yellowish needles (aq. solutions fluoresce blue).
20	soluble	soluble	....	....	crystals with green fluorescence.
21	insoluble	soluble	....	....	monoclinic needles or octohedrons.
22	....	v. soluble	v. soluble	inactive	monoclinic prisms (from ether).
23	....	v. soluble	v. soluble	....	crystals.
24	10.52 (15°)	v. soluble	v. soluble	$[\alpha]_D=-33.1°$	varnish drying syrup, prisms when pure.

(9) When crystalline; at 138° when amorphous.
(10) In alcoholic solution.
(11) When dry.
(12) Decomposes without melting.
(13) In chloroform solution, 1.275 grams in 50 cc.

Number.	Name.	Formula.	Molecular Weight.	Melting Point.
1	**Hyoscine hydrobromide**	$C_{17}H_{21}NO_4.HBr+3H_2O$(1)	438.154	191°–2° (2)
2	sulphate	$(C_{17}H_{21}NO_4)_2.H_2SO_4+2H_2O$(4).	740.472	....
3	**Hyoscyamine**	$C_{17}H_{23}NO_3$	289.192	108.5°
4	hydrobromide	$C_{17}H_{23}NO_3.HBr$	370.122	151.8°
5	hydrochloride	$C_{17}H_{23}NO_3.HCl$	345.662	....
6	sulphate	$(C_{17}H_{23}NO_3)_2.H_2SO_4$(6)	676.474	198.9
7	(pseudo)	$C_{17}H_{23}NO_3$	289.192	133°–4°
8	**Laudanine**	$C_{20}H_{25}NO_4$	343.21	166°
9	**Laudanosine**	$C_{21}H_{27}NO_4$	357.226	89
10	**Lobeline**	$C_{18}H_{23}NO_2$	285.194	....
11	**Lupanine**	$C_{15}H_{24}N_2O$	248.212	44°
12	**Lupinine**	$C_{21}H_{40}N_2O_2$ (or $C_{10}H_{19}NO$).	352.34	68.5°–69.2° (8)
13	hydrochloride	$C_{21}H_{40}N_2O_2.2HCl$	425.276	212°–3°
14	**Lycorine**	$C_{32}H_{32}N_2O_8$	572.276	250° (11)
15	**Morphine**	$C_{17}H_{19}NO_3+H_2O$	303.178	254° (12)
16	acetate	$C_{17}H_{19}NO_3.C_2H_4O_2+3H_2O$.	399.242	ca. 200° (14)
17	hydrochloride	$C_{17}H_{19}NO_3.HCl+3H_2O$	375.678	ca. 250° (15)
18	meconate	$(C_{17}H_{19}NO_3)_2C_7H_4O_7+5H_2O$	860.436	....
19	nitrate	$C_{17}H_{19}NO_3.HNO_3$	348.18	....
20	sulphate	$(C_{17}H_{19}NO_3)_2.H_2SO_4+5H_2O$	758.49	ca. 250° (15)
21	**Narceine**	$C_{23}H_{27}NO_8+3H_2O$(17)	499.274	170° (18)

(1) Also with less H_2O of crystallization depending upon the solvent from which it is crystallized.
(2) When anhydrous.
(3) For an 8% solution of an atrocine free preparation containing .2 H_2O.
(4) Also anhydrous.
(5) For $p = 3.22$.
(6) Also with 2 H_2O.
(7) For $p = 2$.
(8) B. pt. in H = 255.7°.
(9) In aq. solution of specific gravity 1.005.
(10) In 2% solution.
(11) With decomposition.

Number.	Solubility at 25°. Grams per 100 Grams: H_2O.	C_2H_5OH (92.3 wt. %).	$(C_2H_5)_2O$.	Optical Activity.	Crystalline Form, Color, Etc.
1	66.6	6.25	insoluble	$[\alpha]D^{15} = -32.9°$ (3)	rhombic crystals from H_2O.
2	v. soluble	v. soluble	....	....	microscopic needles from H_2O.
3	soluble	v. soluble	soluble	$[\alpha]D^{15} = -20.3$ (5)	needles, tetragonal pyramids or plates.
4	v. soluble	50	0.0625	lævo	prismatic crystals, deliquescent.
5	soluble	soluble	....	....	....
6	v. soluble	15.6	0.04	$[\alpha]D = -28.6°$ (7)	indistinct crystals or powder (deliquescent).
7	sl. soluble	soluble	sl. soluble	....	....
8	....	sl. soluble	0.154 (18°)	inactive	small trimetric prisms.
9	insoluble	v. soluble	5.18 (16°)	$[\alpha]D^{15} = +103.23°$(7).	needles from benzene.
10	....	v. soluble	sl. soluble	....	yellow, honey-like liquid.
11	soluble	soluble	soluble	dextro	needles (also lævo and inactive modifications).
12	decomposes	soluble	soluble	$[\alpha]D^{17} = -19°$ (9)	tables from acetone, rhombic crystals from petroleum ether
13	soluble	soluble	....	$[\alpha]D = -14°$ (10)	large rhombic crystals.
14	sl. soluble	sl. soluble	sl. soluble	....	polyhedric crystals.
15	0.03	0.595	0.0224	$[\alpha]D^{23} = -130.9$ (13)	rhombic prisms, fine needles or crystalline powder.
16	44.4	4.63	insoluble	....	crystalline or amorphous powder.
17	5.87	2.38	insoluble	$[\alpha]D^{25} = -111.5°$(16)	needles or microcrystalline cubes.
18	4.0	soluble	....	....	....
19	soluble	....	....	....	....
20	6.53	0.215	insoluble	....	acicular crystals or cubical masses.
21	0.078 (13°)	0.105 (13°) (19)	insoluble	inactive	prisms or fine needles (deliquescent).

(12) When heated slowly, first turning brown at 200°
(13) In methyl alcohol. C = 2.292.
(14) With loss of acetic acid and water.
(15) Turns brown and chars without melting.
(16) For anhydrous salt, C = 2.24.
(17) Also with .1 and .2 H_2O.
(18) When dehydrated at 100° it melts at 145.2° (cor.)
(19) In 80% alcohol.

Number.	Name.	Formula.	Molecular Weight.	Melting Point.
1	**Narceine** hydrochloride	$C_{23}H_{27}NO_8.HCl+3H_2O$ (1)	535.742	190°–2° (2)
2	bisulphate	$C_{23}H_{27}NO_8.H_2SO_4+2H_2O$	579.342	....
3	**Narcotine**	$C_{22}H_{23}NO_7$	413.194	176°
4	hydrochloride	$C_{22}H_{23}NO_7.HCl$ (5)	449.662	....
5	**Nicotine**	$C_{10}H_{14}N_2$	162.132	b. pt. in H 246.7°
6	hydrochloride	$C_{10}H_{14}N_2.HCl$ (6)	198.60	....
7	salicylate	$C_{10}H_{14}N_2.C_7H_6O_3$	300.18	117.5°
8	tartrate	$C_{10}H_{14}N_2.2C_4H_6O_6+2H_2O$	498.260	....
9	**Oxyacanthine**	$C_{19}H_{21}NO_3$	311.178	202°-214° (7)
10	hydrochloride	$C_{19}H_{21}NO_3.HCl+2H_2O$	383.678	....
11	**Oxysparteine**	$C_{15}H_{24}N_2O$	248.212	84°
12	**Papaverine**	$C_{20}H_{21}NO_4$	339.178	147°
13	hydrochloride	$C_{20}H_{21}NO_4.HCl$	375.646	245°–7° (?)
14	**Paucine**	$C_{27}H_{39}N_5O_5+6\frac{1}{2}H_2O$ (10)	630.466	126° (11)
15	**Pelletierine**	$C_8H_{13}NO$	139.114	b.pt.195°(12)
16	**Pellotine**	$C_{13}H_{19}NO_3$	237.162	110°
17	**Pereirine**	$C_{19}H_{24}N_2O$ (?)	296.212	118°–124°
18	**Physostigmine** (Eserine)	$C_{15}H_{21}N_3O_2$	275.198	105°–6°
19	hydrochloride	$C_{15}H_{21}N_3O_2.HCl$	311.666	....
20	salicylate	$C_{15}H_{21}N_3O_2.C_7H_6O_3$	413.246	178.9° (14)
21	sulphate	$(C_{15}H_{21}N_3O_2)_2.H_2SO_4$	648.482	140° (15)
22	**Pilocarpidine**	$C_{10}H_{14}N_2O_2$	194.132	....
23	platinum chloride	$(C_{10}H_{14}N_2O_2.HCl)_2PtCl_4+4H_2O$	870.304	187° (16)
24	**Pilocarpine**	$C_{11}H_{16}N_2O_2$	208.148	34°
25	hydrochloride	$C_{11}H_{16}N_2O_2.HCl$	244.596	195.9° (19)
26	nitrate	$C_{11}H_{16}N_2O_2.HNO_3$	271.146	170.9° (20)

(1) Also with .5½ H_2O.
(2) When anhydrous.
(3) In 85% alcohol.
(4) In chloroform, neutral solutions are lævo, acid solutions, dextro.
(5) Also .1 H_2O, yields basic salts by recrystallization from hot water.
(6) With .2 HCl (Hager).
(7) In hydrated form m. pt. = 138°–146°.
(8) For $p = 4$ in chloroform.
(9) For $p = 2$ in aq. solution.
(10) Anhydrous according to Beilstein.
(11) Decomposition temperature.
(12) B. pt. at 100 mm. = 125°.

Number.	Solubility at 25°. Grams per 100 Grams: H_2O.	C_2H_5OH (92.3 wt. %).	$(C_2H_5)_2O$.	Optical Activity.	Crystalline Form, Color, Etc.
1	sl. soluble	soluble	....	....	lemon yellow crystals.
2	....	soluble	....	....	fine needles.
3	insoluble	l. (cold) (3)	0.6 (16°)	$[\alpha]D = -$ 207.35° (4)	needles, prisms or rhombic columns.
4	soluble	....	....	....	....
5	v. soluble	v. soluble	v. soluble	$[\alpha]D = -$ 161.55°	colorless oil $d_{20} = 1.011$, very hygroscopic.
6	v. soluble	soluble	....	dextro	crystals.
7	soluble	soluble	....	....	plates.
8	soluble	....	....	....	....
9	....	soluble	soluble	$[\alpha]D^{15} = +$ 131.6° (8)	hydrated flakes, anhydrous needles from alcohol.
10	....	....	....	$[\alpha]D^{15} = -$ 163.6° (9)	small needles.
11	v. soluble	v. soluble	v. soluble	....	white hygroscopic needles.
12	insoluble	sl. soluble	0.38 (10°)	inactive	prisms.
13	2.7 (18°)	....	....	....	large columns.
14	insoluble	insoluble	insoluble	....	yellow leaflets.
15	4.35 (cold)	v. soluble	v. soluble	dextro (13)	oily liquid of $d_0 = 0.988$.
16	insoluble	v. soluble	v. soluble	....	plates from alcohol.
17	insoluble	v. soluble	v. soluble	....	amorphous powder.
18	sl. soluble	v. soluble	v. soluble	lævo	trimetric prisms from benzene.
19	soluble	....	....	....	....
20	1.38	7.87	0.57	....	acicular or short columnar crystals.
21	v. soluble	v. soluble	0.083	....	micro-crystalline powder.
22	soluble	v. soluble	sl. soluble	$[\alpha]D = +$ 81.3° (17)	syrup (crystalline (?)).
23	....	insoluble	....	....	orange yellow leaflets or dark red pyramids.
24	v. soluble	v. soluble	sl. soluble	$[\alpha]D^{18} = +$ 106° (18)	needles very hygroscopic.
25	333	43.5	insoluble	$[\alpha]D = +$ 91.74° (21)	prismatic crystals, deliquescent.
26	25	1.66	insoluble	$[\alpha]D = +$ 82.9° (22)	shining crystals, prisms.

(13) Becomes inactive when heated to 100° with an alkali; the salts are lævo.
(14) Softens and turns yellow at 160°.
(15) Softens at 130°.
(16) Of anhydrous salt, with decomposition; air-dried salt melts at 88°–9°.
(17) For C = 1.5374.
(18) In 2% aq. solution.
(19) When dried at 100°, 200°–5°, Beilstein.
(20) 178° cor., Beilstein.
(21) For C = 9.924.
(22) For C = 9.572.

Number.	Name.	Formula.	Molecular Weight.	Melting Point.
1	**Pilocarpine** sulphate	$(C_{11}H_{16}N_2O_2)_2.H_2SO_4$	514.342	132° (120°)
2	**Piperine**	$C_{17}H_{19}NO_3$	285.162	130°
3	**Pseudo pelletierine**	$C_9H_{15}NO.2H_2O$	189.162	48° (2)
4	**Quinidine**	$C_{20}H_{24}N_2O_2$ (3)	324.212	171.5° (4)
5	hydrochloride	$C_{20}H_{24}N_2O_2.HCl+H_2O$	378.696	......
6	sulphate	$(C_{20}H_{24}N_2O_2)_2H_2SO_4+2H_2O$	782.542	......
7	**Quinine**	$C_{20}H_{24}N_2O_2+3H_2O$	378.260	57°
8	(anhydrous)	$C_{20}H_{24}N_2O_2$	324.212	174.9°
9	bisulphate	$C_{20}H_{24}N_2O_2.H_2SO_4+7H_2O$	548.410	ca. 160° (11)
10	sulphate	$(C_{20}H_{24}N_2O_2)_2.H_2SO_4+7H_2O$(10)	872.622	205° (12)
11	hydrobromide	$C_{20}H_{24}N_2O_2.HBr+H_2O$	423.156	152°–200°
12	hydrochloride	$C_{20}H_{24}N_2O_2.HCl+2H_2O$	396.712	156°–190°
13	salicylate	$C_{20}H_{24}N_2O_2.C_7H_6O_3+\frac{1}{2}H_2O$	471.268	183°–7°
14	**Sabadine**	$C_{29}H_{51}NO_8$	541.418	238°-240°(14)
15	**Sanguinarine**	$C_{20}H_{15}NO_4+H_2O$	351.146	213°
16	**Solanine**	$C_{28}H_{47}NO_{10}+2H_2O$(?)	557.386	250°
17	**Sparteine**	$C_{15}H_{26}N_2$	234.228	b. pt. 180°–181° (17)
18	bisulphate	$C_{15}H_{26}N_2.H_2SO_4+5H_2O$(16)	422.394	136° (18)
19	**Strychnine**	$C_{21}H_{22}N_2O_2$	334.196	268°
20	nitrate	$C_{21}H_{22}N_2O_2.HNO_3$	397.214	decomposes

(1) For C = 7.318.
(2) B. pt. = 246°.
(3) Crystallizes in different forms, with H_2O and other substances of crystallization according to the solvent employed.
(4) When dry.
(5) In 80% alcohol.
(6) In 1.06% solution in a mixture of 1 vol. alcohol and 2 vols. chloroform; +274.7°, Brühl.
(7) In 97% alcohol.
(8) For 3% solution in chloroform.
(9) For 0.657 gram in 100 cc. of 97% alcohol.

Number.	Solubility at 25°. Grams per 100 Grams: H_2O.	C_2H_5OH (92.3 wt. %).	$(C_2H_5)O_2$.	Optical Activity.	Crystalline Form, Color, Etc.
1	soluble	soluble	....	$[\alpha]_D = +$ 84.72 (1)	crystals from alcohol-ether.
2	insoluble	6.66	277	inactive	large monoclinic columns.
3	soluble	soluble	soluble	inactive	prismatic plates from petroleum ether.
4	0.05(15°)	4.0 (20°) (5)	4.5 (20°)	$[\alpha]_D^{17} = -$ 274.7° (6)	needles from benzene (3).
5	1.6 (10°)	v. soluble	v. sl. soluble	$[\alpha]_D = +2.212$ -2.562 (7)	prisms.
6	1.0 (15°)	12	v. sl. soluble	$[\alpha]_D = +$ 184.17(8)	prisms, solutions fluoresce blue.
7	0.0645	166	76.9	$[\alpha]_D^{15} = -$ 145.2°(9)	flaky or microcrystalline powder, effloresces.
8	0.0571	166	22.2	lævo	amorphous powder.
9	11.76	5.55	0.0565	....	orthorhombic or small needles (effloresces).
10	0.139	1.16	v. sl. sol.	....	silky crystals or prismatic monoclinic needles (effloresces).
11	2.5	149.2	6.25	....	silky needles (effloresces).
12	5.55	166	0.415	$[\alpha]_D^{15} = -$ 144.98°(13)	silky needles (effloresces).
13	1.3	9.1	0.91	....	colorless needles.
14	sl. soluble	v. soluble	sl. soluble	....	needles (from ether).
15	insoluble	soluble	soluble	inactive	needles (from acetic ether) (15) blue violet fluorescence.
16	v. sl. sol.	soluble	insoluble	....	needles.
17	v. sl. sol.	soluble	soluble	$[\alpha]_D = -$ 14.6° (19)	oily liquid, yellowish syrupy liquid (Hager)
18	91	41.7	insoluble	....	rhombohedral crystals or powder.
19	0.0156	0.91	0.0182	lævo	prismatic rhombic crystals or powder.
20	2.38	0.83	insoluble	$[\alpha]_D =$ ca. $-$ 36°	needles, glistening prisms.

(10) Sometimes .8 H_2O.
(11) Softens at 60°, becomes semifluid at 70°, and melts at 160° with decomposition.
(12) When dried over H_2SO_4.
(13) For 3.15 grams in 100 cc. H_2O.
(14) With decomposition.
(15) The salts are deep red.
(16) Varying mols. H_2O of crystallization.
(17) At 20 mm.
(18) When anhydrous.
(19) In alcohol.

Number.	Name.	Formula.	Molecular Weight.	Melting Point.
1	**Strychnine** sulphate....	$(C_{21}H_{22}N_2O_2)_2.H_2SO_4+5H_2O$	856.558	200° (1)
2	**Thebaine** (para morphine).	$C_{19}H_{21}NO_3$..............	311.178	193°
3	hydrochloride.......	$C_{19}H_{21}NO_3.HCl+H_2O$....	365.662	....
4	**Theobromine**..........	$C_7H_8N_4O_2$..............	180.104	329°–330° (4)
5	**Theophylline**..........	$C_7H_8N_4O_2+H_2O$.........	198.120	264°
6	**Tritopine**.............	$C_{42}H_{54}N_2O_7$..............	698.452	182°
7	**Tropacocoaine** hydrochloride.	$C_{15}H_{19}NO_2.HCl$.........	281.630	271°
8	**Tropine**..............	$C_8H_{15}NO$..............	141.13	61.2°–63° (5)
9	platinum hydrochloride.	$(C_8H_{15}NO.HCl)_2.PtCl_4$ ...	692.236	198°–200°
10	**Veratrine**.............	$C_{37}H_{53}NO_{11}$..............	687.434	180°
11	**Yohimbine**............	$C_{23}H_{32}N_2O_4$ (?)..........	400.276	231°

(1) When anhydrous.
(2) In 2% solution in 97% alcohol. (3) $P=2.33$.

Number.	Solubility at 25°. Grams per 100 Grams:			Optical Activity.	Crystalline Form, Color, Etc.
	H_2O.	C_2H_5OH (92.3 wt. %).	$(C_2H_5)O_2$.		
1	3.22	1.54	insoluble	....	prismatic crystals or powder(efflorescent).
2	v. sl. sol.	0.10	0.71 (10°)	$[\alpha]D^{15} = -218.64°$ (2)	leaflets, or prisms.
3	6.33 (10°)	....	....	$[\alpha]D = -168.32$ (3)	large rhombic prisms.
4	0.0305 (18°)	0.045 (21°)	insoluble	....	lumpy crystalline powder(from H_2O),microscopic rhombic crystals sublimes, 290–5°.
5	0.55	sl. soluble	....	....	thin monoclinic plates, needles (from H_2O).
6	....	soluble	sl. soluble	....	prisms (from alcohol) plates (from ether).
7	soluble	....	....	....	needle-shaped crystals.
8	v. soluble	v. sl. sol.	v. sol.	inactive	plates(from abs. ether) very hygroscopic.
9	soluble	insoluble	....	....	orange red monoclinic table, columns.
10	insoluble	9	9	inactive	amorphous resinous mass.
11	v. sl. sol.	soluble	soluble	dextro	glistening needles.

(4) In closed tube. (5) B. pt. 229–33°.

XXXII.—PHYSICAL AND CHEMICAL

COMPILED BY

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Ajowan:** (*Carum ajowan*)	.900 to .930 (1)	+ 1.0 to + 1.5 (2)	. . . .
2	**Allspice:** (*Pimenta officinalis*).	1.045 to 1.055 (2) (1.024–1.055) (1)	. . . . −1 to −5 (1)	. . . . 1 pt. in 2 of 70%
3	**Ammoniac:** (*Dorema ammoniacum*).	.891 (1)	slightly dextrogyrate (2)	. . . .
4	**Angelica Root:** (*Angelica officinalis*).	.857 to .918 (1) .855 to .905 (2)	+ 16 to + 32 (1)	. . . .
5	Japanese Angelica Rt. (*Angelica refracta* and *A. anomala*).	.915 .910 at 20° (1)	. . . .	. . . .
6	**Angelica Seed:** (*Angelica officinalis*).	.856–.890 (1)	+ 11 to + 12 (1)	. . . .
7	**Angostura:** (*Galipea cusparia*).	.930–.960 (2)	− 36 to − 50 (2)	. . . .
8	**Anise Seed:** (*Pimpinella anisum*).	.980–.990 at 17° C. (5 and 2)	lævogyrate to − 1.9 (2)	1 pt. in 1½ to 5 of 90% (1)
9	**Anise Bark:** (Unknown source).	.969	− 0.8	. . . .
10	**Anise, Star:** (Chinese) (*Illicium verum*).	.980–.990 at 17° C. (2) (5) .975–.988 (25°)	slightly − to about − 2 (1) rarely slightly +	1 pt. in 3 of 90% alc.
11	**Anise, Star:** (Japanese) (*Illicium religiosum*) (leaves).	1.006 at 16.5° C. (1)	− 8.1 (2)	. . . .
12	**Arnica:** [*Arnica montana* (flowers)].	.906 (1)	. . . .	. . . .
13	[*Arnica montana* (rhizome)].	.990–1.000 (1)	− 2 (2)	. . . .
14	**Asafœtida:** (*Ferula fœtida*).	.975–.990 (1)	− 9° 15′ †	. . . .
15	**Asarum Canadense:**	.930–.960 (2)	− 3.5	2 parts 70%
16	**Asarum Europæum:**	1.015–1.068 (2)	. . . .	. . . .
17	**Basil:** (European) (*Ocymum basilicum*).	.905–.930 (1)	− 6 to − 22 (1)	1 pt. in 2 of 80%
18	(Réunion)	.945–.987 (1)	+ 7 to + 12 (1)	1 pt. in 7 of 70%

* About 20° C.

The numbers in brackets in the table refer to the following authorities:

(1) Schimmel & Co., Semi-Annual Reports.
(2) Commercial Organic Analysis, Allen.
(3) E. J. Parry.
(4) Bush & Co.
(5) United States Pharmacopœia.
(6) Gildermeister and Hoffman.

CONSTANTS OF ESSENTIAL OILS

ALBERT F. SEEKER

No.	Other Characters.	Chief Known Constituents.
1	Smells strongly of thymol, of which it contains 45–55%.	Thymol; cymene.
2	Refractive index (20°) 1.5309–1.5303 (3)......	....
	Produces semi-solid mass with equal vol. strong caustic soda. Not less than 65% eugenol (5).	Eugenol; sesquiterpene.
3	Boils principally between 250–290°, beginning at 155° C.	....
4	Saponification value 37.7 (4). Distils chiefly between 60–70° C. Ref. index (20°) 1.4800.	Phellandrene; valeric acid.
5	Crystals separate at +10°, and oil solidifies at 0°. Boiling point between 170–310°.	......do................
6	Pale yellow oil darkens with age.............	Phellandrene; valeric acid.
7	....	Cadinene; galipol; galipene; pinene.
8	Deposits anethol on cooling. Solidifying point 10 to 15° C. (15–19° [1]). Refractive index 1.552–1.558 (20° C.) (3).	Anethol; methyl clavicol.
9	....	Methyl clavicol.
10	Solidifying point +14 to +18°. Refractive index 1.552–1.558 (20° C.) (3).	Anethol; anise aldehyde and ketone; methyl clavicol; safrol.
11	....	Anethol; safrol; eugenol.
12	Acid value 75.1. Sapon. value 29.9. Usually of buttery consistency.	....
13	Yellow color, becoming darker with age.....	Dimethyl ester of thymoquinol.
14	....	Alkyl disulphides.
15	Yellowish-brown oil..........................	Asarol; methyl eugenol.
16	Thick, brownish liquid	Asarone; methyl eugenol.
17	....	Methyl clavicol; cineol. linalol.
18	....	....

† One sample.

(7) Pharmacographia Indica.
(8) Hesse and Müller, Berichte, 32.
(9) Joancard and Satie.
(10) Bulletin 109, U. S. Dept. Ag.
(11) Soldaini and Berté.
(12) Charabot.
(13) Daufresne.

No.	Oil and Chief Botanical Source.	Specific Gravity. 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Bay:** (*Pimenta acris*)...	9.65–.995 (3)	lævogyrate (as much as −2)	....
2	**Bergamot:** [(expressed) *Citrus bergamia*].	.880–.886	+8 to +20 (not more than +20 [5])	1 pt. in 2 of 80%
3	**Birch:** (*Betula lenta*) ...	1.180–1.187	inactive	1 pt. in 5 of 70%
4	**Bitter Almond:** [*Prunus Amygdalus var. amara*].	1.045–1.071 (2) 1.045–1.060 (25°) (5)	inactive	1 pt. in 2 of 70%
5	HCN removed.......	1.050–1.055 (1)	inactive	1 pt. in 2 of 70%
6	**Cade:** (*Juniperus Oxycedrus*).	.99–1.05	....	soluble in hot 90%
7	**Cajuput:** (*Melaleuca Leucadendron*).	.920–.930 .915–.925 (25°) (5)	− 10′ to −2° (1) not more than −2 (5)	soluble in equal part 80%
8	**Calamus:** (*Acorus calamus*).	.960–.980 (Japanese (2) .985–1.00)	+10 to +31	all proportions of 90%
9	**Camphor:** [*Cinnamomum Camphora*. (Wood and twigs.)].	.870–1.040 (2)	+12 to +32 (2)	....
10	**Camphor Wood:** [(Venezuelian) Source unknown].	1.155 (2)	+2.7 (2)	....
11	**Cananga:** (*Cananga odorata*).	.896–.942 (30°) (1)	− 27 to − 87 (30°) (1)	....
12	**Canella:** (*Canella alba*)..	.920–.935 (1)	+1° 8′ †	....
13	**Caraway:** (*Carum Carvi*)	.907–.915 (1) .900–.910 (25°) (5)	+70 to +85 (3) +70 to +80 (25°) (5)	equal pt. 90%
14	**Cardamoms:** (*Elettaria repens*). (Ceylon)..........	.895–.905 (1)	+12 to +15 (1)	1 pt. in 2 of 80%
15	(Malabar).........	.933–.943 (6)	+26 to +34 (6)	1 pt. in 4 of 70%
16	(Siam) † (6)......	.905 (42° C.)	+38° 4′ (42° C.)	1 pt. in 1.2 of 80%
17	**Cedar Leaves:** [(Commercial) *Juniperus Virginiana*].	.868–.920 (1) .883–.888 (3)	−3 to −24 +55 to +65 (3)	....
18	**Cedar Wood:** [*Juniperus Virginiana*].	.945–.960 (6)	−30 to −40 (1)	1 pt. in 20 of 90%
19	**Celery Seed:** (*Apium graveolens*).	.870–.895 (1)	+67 to +79 (6)	....

No.	Other Characters.	Chief Known Constituents.
1	Mixed with equal volume concentrated caustic soda forms semi-solid mass. Refractive index 1.487–1.585 (20°) (3).	Eugenol; clavicol; myrcene.
2	Refractive index (20°) 1.465–1.470 (3). Residue on evaporation not more than 6%. Contains 30–45% linalyl acetate. Acid value 1.4–3.5. Ester value 96.4 †.	Linalyl acetate; linalol; limonene.
3	Odor of wintergreen. Boils 218–221° C.......	Methyl salicylate.
4	Clear solution on warming with excess of saturated solution sodium bisulphite. Boiling point about 180°. Not less than 85% benzaldehyde. 2–4% hydrocyanic acid (5). Ref. index 1.542–1.551 (20°) (3).	Benzaldehyde; hydrocyanic acid; phenyloxyacetonitril.
5	....do..................................	....
6	Thick, clear liquid, tarry odor, burning, bitter taste. 68–80% vol. between 150–300°.	Cadinene.
7	Usually bluish-green, due to traces copper. Becomes semi-solid when shaken with phosphoric acid (Sp. gr. 1.75). Refractive index 1.460–1.466 (20°) (3).	Cineol (not less than 55% (5)).
8	Sapon. value 16–20 (after acetylization 40–50). Boils 170–300° C. Refractive index 1.507–1.515 (20°) (3).	Asarone; eugenol; acetic, oenanthilic, heptylic and palmitic acid.
9	Very variable, being a by-product from the production of common camphor.	Pinene; camphor; cineol; phellandrene; dipentene; safrol; eugenol.
10	Solidifies to crystalline mass at ordinary temperatures.	Apiol.
11	Sapon. value 42–94(1). Refractive index (30°) 1.4788–1.5082 (1).	Esters of geraniol; linalol.
12	....	Eugenol; cineol; caryophylene.
13	Refractive index (20°) 1.4867–1.4970 (3). Boils 175–230° C. (1). Not more than 15% should distil below 185° (2). Carvone 50–60%.	Carvone; dextro-limonene.
14	Refractive index 1.460–1.470 (20°) (3).	Terpinene; dipentene; acetic esters; limonene.
15	Saponification value 132 (6)................	Cineol.
16	Sapon. value 18.8 (after acetylization 77.2). Refractive index 1.4639 (20°) (3).	Borneol.
17	Savin-like odor..........................	Limonene; cadinene; borneol; bornyl esters.
18	Refractive index (20°) 1.498–1.503 (3).......	Cedrene; cedar camphor.
19	....	Limonene; phenols; sedanolide; sedanonic acid.

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Chamomile:** [(German) *Matricaria Chamomilla*].	.930–.940 (1)	very slight	Turbid with 90%
2	**Chamomile:** [(Roman) *Anthemis nobilis*].	.905–.915 (6)	+1 to +3 (6)	1 pt. in 6 of 70%
3	**Cherry Laurel:** (*Prunus laurocerasus*).	1.054–1.066 (1)	. . . .	1 pt. in 2 of 70%
4	**Cinnamon Bark:** [(Ceylon) *Cinnamomum zeylanicum*].	1.024–1.040 (1)	0 to −1 (2)	1 pt. in 2 of 70%
5	[(Cassia) *Cinnamomum cassia*].	1.045–1.055 (25°) (5) 1.055–1.070 (1)	+1 to −1 (2)	1 pt. in 2 of 80%
6	**Cinnamon Leaves:** (*Cinnamomum zeylanicum*).	1.044–1.065 (1)	−0° 5′ to +1° 18′ (1)	1 pt. in 3 of 70%
7	**Citronella:** [(Singapore) *Andropogon nardus*].	.886–.900 (1)	−0° 34′ to −3° (1)	1 pt. in 2 of 80%
8	(Lana Batu)	.900–.920 (1)	−5 to −21 (1)	1 pt. in 2 of 80%
9	**Clove:** (*Eugenia caryophyllata*).	1.048–1.070 (3) 1.040–1.060 (25°) (5)	slightly lævogyrate up to −1° 10′ (1)	1 pt. in 2 of 70%
10	**Cognac**	.875–.885 (1)	+0° 43′ to −0° 3′ (1)	1 pt. in 3.5 of 80%
11	**Copaiba:** (*Copaiba Langsdorffii* and other species).	.895–.905 (25°) (5)	[−2 (2)] −7 to −35 (1)	1 pt. in 10 of 95% (5)
12	**Coriander:** (*Coriandrum sativum*).	.863–.878 (25°) (5) .870–.885 (1)	[+7 to +14 (25°) (5)] +8 to +13 (1)	1 pt. in 3 of 70%
13	**Cubebs:** (*Piper Cubeba*).	[.905–.925 (25°) (5)]-.910-.930 (1)	−25 to −40 (6)	1 pt. in 1 of 95%
14	**Cumin:** (*Cuminum cyminum*).	.900–.930 (1)	+4 to +8 (1)	1 pt. in 3 to 10 of 80%
15	**Cypress:** (*Cypressus sempervirens*).	.866–.890 (1)	+4 to +31 (1)	1 pt. in 4–5 of 90% (6)
16	**Dill:** (*Peucedanum graveolens*).	.895–.915 (1) [.905–.920 (7)]	+70 to +80 (2) [not less than +70 (7)]	1 pt. in 5 to 8 of 80% (1)
17	**East Indian:** (*Anethum sowa*).	.948–.970 (6)	+41 to +50 (6)	. . . .
18	**Elemi:** (From *Manilla Elemi*).	.870–.910 (1)	about +44 (6)	. . . .
19	**Erigeron:** (*Erigeron Canadensis*).	.850–.870 (6) [.855–.890 increasing with age (2)]	[not less than +45 (25°) (5)] +52 (6)	equal part of 90%

No.	Other Characters.	Chief Known Constituents.
1	Solid at 0° and deposits crystals at 15°. Sapon. value 45 (1).	A paraffin.
2	Sapon. value 250–317 (6). Blue color when fresh, changing to green and finally to yellow-brown. Refractive index 1.4455 (20°) (3).	Esters of butyric, angelic and tiglic acid.
3	....	Benzaldehyde; hydrocyanic acid.
4	Cinnamic aldehyde 65–75% (6). Refractive index 1.590–1.599 (20°) (3).	Cinnamic aldehyde; eugenol.
5	Refractive index (20°) 1.585–1.605 (3). Boils 240–260°. Not less than 75% cinnamic aldehyde (5).	Cinnamic aldehyde 70–85% (2).
6	Refractive index 1.535 (20°) (3).............	Eugenol; cinnamic aldehyde; safrol.
7	Contains 80–91% geraniol (6). Refractive index 1.465–1.468 (20°).	Geraniol; citronellal.
8	Refractive index (20°) 1.4811–1.4830 (3). Contains 50–70% geraniol (6).	Geraniol; citronellal; methyl eugenol.
9	Refractive index (20°) 1.5301–1.5360 (3). Boils between 250–260° C. Contains 80–90% eugenol. Becomes semi-solid on shaking with strong ammonia.	Eugenol; caryophyllene. [Not less than 80% eugenol (5)].
10	Ester value 140–250. Acid value 50 to over 100(1).	Esters caprinic and caprylic acid.
11	Boils 250–275° C. (1)	Chiefly sesquiterpenes.
12	Refractive index (20°) 1.4665 (3)............	Linalol; pinene.
13	Viscid greenish color. Boils 175–280°; 80% volatile between 250–280° C. Refractive index 1.49–1.496 (20°) (3).	Cadinene; dipentene.
14	Limpid liquid with sharp taste..............	Cymene; cumic aldehyde.
15	Boils 160–250° (6).........................	Pinene; cymene; valeric acid; camphene; cypress camphor.
16	Penetrating odor; taste at first sweetish, then sharp and burning. Refractive index 1.48–1.495 (20°) (3).	Phellandrene; terpinene; carvone.
17	....	Limonene; dill-apiol.
18	Agreeable aromatic odor and taste..........	Dipentene.
19	Larger part distils between 175–180° C. (2)...	*d*-limonene; terpineol; esters.

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Eriodictyon:** (*Eriodictyon Californica*).	0.937 (2)	−1.6 (2)	soluble in 70% (2)
	Eucalyptus:			
2	(*amygdalina*)	.850–.886 (1) .855–.890 (3)	−25 to −70 (1) (−89) (3)	1 pt. to more than 6 of 90%
3	(*Baileyana*)	.890–.940 (2)	....	....
4	(*cnèorifolia*)	.899–.923 (2)	−4 to −14 (2)	....
5	(*dealbata*)	.871–.900 (2)	....	....
6	(*dumosa*)	.884–.915 (2)	0 to +6.5 (2)	....
7	(*eugenoides*)	.905–.910 (3)	+3.7 to +5.2 (6)	....
8	(*globulus*)	.910–.930 (1) [.915–.925 (5)]	+1 to +15 (1)	1 pt. in 3 of 70%
9	(*hæmastoma*)	.880–.890 (2)	....	....
10	(*leucoxylon*)	.915–.927 (2)	+0.5 to +2.7 (2)	....
11	(*macrorrhyncha*)	.924–.927 (22°)	....	....
12	(*maculata* variety *citriodora*).	.870–.905 (2)	±0 to +2 (2)	1 pt. in 4–5 of 70%
13	(*microcorys*)	.896–.935 (2)	....	....
14	(*odorata*)	.899–.925 (2)	slightly lævogyrate	....
15	(*oleosa*)	.905–.930 (3)	−5 to +5 (3)	....
16	(*piperita*)	.909–.913 (2) [(17°)	−3 to +1.6 (2)	....
17	(*punctata*)	(6) .912–.920	−2.5 to +4.4 (6)	....
18	(*Risdonia*)	.910–.925 (3)	−2 to −6 (3)	....
19	(*rostrata*)	.912–.925 (2)	−1.1 to +13 (2)	1 pt. in 2 of 70%
20	(*Woolsiana*)	.889 (2)	−13.7 (2)	....
21	**Fennel:** [(Commercial) *Fœniculum capillaceum*].	.960–.980 (2) .953–.973 (25°) (5)	+12 to +24 (6)	sol. in equal pt. 90%
22	(Japanese)	.975–.976 (6)	+10 to +16 (6)	....
23	(Macedonian)	.970–.980 (6)	+5 to +12 (6)	....
24	(Roman)	.976–.980 (6)	+7° 50′ to 16°30′	....
25	(Wild)	.905–.925 (6)	+48 (6)	....
26	[(Water) *Oenanthe aquatica*].	.85–.89 (6)	+12° 42′ to +15° 30′	....
27	**Galangal:** (*Alpinia officinarum*).	.915–.925 (1)	−1° 30′ to −3° 30′ (1)	1 pt. in ½ of 90%
28	**Galbanum:** (*Ferula galbaniflua*)..	.910–.940 (6)	+20 to − 10 (6)	....
29	**Garlic:** (*Allium sativum*).	1.046–1.057	inactive	....

No.	Other Characters.	Chief Known Constituents.
1	....	....
2	Refractive index 1.4735 (20°) (3).............	Phellandrene; cineol.
3	Boils 160–185° (6). Contains about 30% cineol (1).	Cineol; citral; phellandrene.
4	Has an odor resembling dill and caraway.....	Cineol; cuminal.
5	Boils 206–216° (6).........................	Citronellal; citronellol.
6	....	Cineol.
7	....	Cineol.
8	Refractive index 1.460 – 1.467 (20°) (3). Deposits crystals on cooling in freezing mixture. Semi-solid mass with phosphoric acid (1.75 sp. gr.).	Cineol; pinene; aldehydes.
9	Boils 170 – 250° C. (1)......................	Cineol; terpenes.
10	....	Cineol.
11	Begins to boil 172° (1)......................	Cineol; eudesmol.
12	Citronellal 80–90% (6)......................	Citronellal; geraniol; citronellol.
13	Boils 160–200° (1). Contains about 30% cineol (1).	d-pinene; cineol.
14	Boils 157–199° (6). Solidifies in a freezing mixture.	Cineol; cuminal.
15	....	Cineol; cuminal.
16	Boils 170–272° (1).........................	Phellandrene; cineol; eudesmol; piperitone.
17	Contains about 46 – 64% cineol (1)...........	Cineol.
18	....	Cineol; phellandrene; piperitone.
19	Boils 137 (?) – 181° (6)	Cineol; valeric aldehyde.
20	....	Aromadendral.
21	Solidifying point about 3 – 6° C. (6). Not less than + 5° (5). Refractive index 1.525–1.534 (20°) (3). B. pt. 160–220°.	Anethol; fenchone.
22	Solidifying point about 7° C. (6)............	Anethol; fenchone.
23	Solidifying point 7 – 12° C. (6)...............	Anethol; phellandrene; limonene.
24	Solidifying point 10 – 12° C. (6)..............	Anethol.
25	....	d-phellandrene; fenchone.
26	50–60% volatile between 170 – 172°..........	Phellandrene.
27	Boils 170–275° (1). Ref. ind. 1.480 (20°) (3).	Cineol; eugenol.
28	....	d-pinene; cadinene.
29	....	Allyl-propyl disulphide; diallyl disulphide.

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
	Geranium: [(Rose Geranium). Several species of *Pelargonium*].			
1	(French)..........	.897–.905 (6)	−7.5 to −9 (6)	2–3 vols. 70%
2	(Réunion)........	.889–.895 (6)	−8 to −11 (6)	2–3 vols. 70%
3	(Algerian)........	.892–.900 (6)	−6.5 to −10 (6)	2–3 vols. 70%
4	(Spanish).........	.897 (6)	−10 to −11 (6)	not completely sol.
5	(German †).......	.906 (1)	−16	....
6	**Ginger:** (*Zingiber officinale*).	.875–.885 (1) [.882–.900 (4)]	−25 to − 45 (1) [(4)] [−12.4 to −45.3	1 pt. in 100 of 95% ....
7	**Grains of Paradise:** (*Amomum melegueta*).	.894 (1)	−4 (1)	....
8	**Guaiac Wood:** (*Bulnesia sarmienti*).	(30°) .965–.975 (1)	−6 to −7 (30°) (1)	sol. in 70%
9	**Gurjum Balsam:** Species of *Dipterocarpus*.	.915–.930 (1)	−35 to −130 (1) sometimes strongly + (7)	sparingly in 95%
10	**Hops:** (*Humulus lupulus*).	.855–.880 (6) .840–.882 (3)	+28′ to +40′ (6)	very sparingly in 95%
11	**Jasmine:** (*Jasminum grandiflorum*).	1.007–1.018 (8)	+2.5 to +3.5 (8)	....
12	**Juniper Berries:** (*Juniperus communis*) (Hungarian).	.865–.882 (6) .860–.885 (1) .862–.868 (6)	slightly + to − 11 (6) 0 to −18° 48′ (6)	variable; sometimes not completely in 90%
13	**Jaborandi:** (*Pilocarpus jaborandi*)	.865–.895 (1)	+3° 25′ (1)	1 pt. in 2 of 80%
14	**Laurel Berries:** (*Laurus nobilis*).	.915–.935 (6)	−14° 10′ (6) †	sol. in 90%
15	**Laurel Leaves:** (*Laurus nobilis*).	.920–.930 (1)	−15 to −18 (1)	1 pt. in 3 of 80%
16	**Lavender:** (*Lavendula officinalis*)	.875–.910 (25°) (5)	....	1 pt. in 3 of 70%
17	(French)..........	.880–.895	−6 to −10 (9). −3 to −9 (1)	1 pt. in 3 of 70%
18	(English).........	.885–.900 (1)	−1 to −10 (1)	1 pt. in 3 of 70%
19	(Spike)........... (*Lavendula spica*, D.C.)	.905–.915 (1)	−1 to +7 (1)	1 pt. in 6 of 65%
20	**Lemon:** (*Citrus medica var. limonum*).	[.851–.855 (25°) 5] .856–.861 (15.6°)	+54 to +66 (20°)	not sol. to clear sol. owing to presence of wax

No.	Other Characters.	Chief Known Constituents.
1	Refractive index 1.460–1.471 (20°) (3). Esters as geranyl tiglate 25–28%.	Geraniol; citronellol, and their esters, chiefly tiglates.
2	Esters as geranyl tiglate 27–33%. Green color.	
3	Esters as geranyl tiglate 19–29%............	
4	Esters as geranyl tiglate 35–42%............	
5	....	
6	Boils 155–300° C. (1). Refractive index 1.488–1.495 (20°) (3).	Phellandrene; *l*-zingiberene.
	....	....
7	Boils 236–258° C. (1)......................	....
8	Sapon. value about 4 (1). Very viscid oil, tea-like odor, and crystalline at ordinary temperatures.	Guaiol.
9	Boils 255–256° C. (1). Sapon. value after acetylization about 9.6 (6).	A sesquiterpene.
10	Refractive index (20°) 1.4775 (3)............	Humulene; geraniol; terpenes.
11	Esters as benzyl acetate 69–73% (8).........	Benzyl acetate; linalyl acetate; linalol.
12	Varies greatly in appearance and properties, according to origin and mode of preparation. Refractive index 1.474–1.488 (20°)(3).	Pinene; cadinene; juniper camphor.
13	Boils 180–290° C. (1). Sometimes solidifies on cooling.	Pilocarpene (?); ketones.
14	Sometimes solidifies above 0° C.............	Pinene; cineol; lauric acid.
15	....	Pinene; cineol; methyl clavicol; eugenol.
16	Refractive index 1.462–1.4675 (20°) (3).......	....
17	Refractive index (20°) 1.4638–1.4643 (3). Sapon. value after acetylization 160 (9).	Linalyl acetate 30–45%; linalol.
18	Refractive index (20°) 1.4660–1.4678 (3)......	Linalyl acetate 5–10%; cineol.
19	Refractive index (20°) 1.4666 (3). Sapon. value about 15 (1). Odor resembles both lavender and rosemary.	Pinene; camphene; cineol; camphor; borneol, linalol.
20	Refractive index (20°) 1.4743–1.4760 (1). First 10% of distillate (using Ladenburg flask) should have optical rotation differing from that of original oil by not more than 5° (1). First 50% of distillate must have higher rotation than original oil and the residue (11). Residue at 100° not more than 5%.	*d*-limonene; citral.

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Lemongrass:** (*Andropogon citratus*).	.895–.905 (3)‡	+3 to −3 (3) [−12.7 (4)]	1 pt. in 2 of 70%
	Lime (Limette): (West Indian. *Citrus medica, var. acida*).	.877–887 (3) §		
2	Expressed.........	.873–.885 (2)	+35 to +40 (2)	....
3	Distilled..........	.856–.868 (1 and 3)	+38 to +45	....
	(Italian. *Citrus limetta*).			
4	Expressed.........	.872 (1) .882 (2)	+58 (6)	....
5	Distilled..........	.863–.866 (2)	+34.8 to +45 (2)	....
	Linaloe:			
6	[(Mexican). Species of *Bursera*].	.875–895 (1)	+8 to −13 (2) [−5 to −12 (1)]	1 pt. in 2 of 70%
7	[(Cayenne) *Ocotea candata* (?)].	.870–.880 (1)	−15 to −20 (1)	1 pt. in 2 of 70%
8	**Lovage:** (*Levisticum officinale*).	1.000–1.040 (6) [.963–1.023 (4)]	± 0 to +5 (6) [−14 to +12 (4)]	1 pt. in 3 of 80%
9	**Mace:** (*Myristica fragrans*).	.890–.930 (1)	+10 to +20 (1)	1 pt. in 3 of 90%
10	**Male Fern.** (*Dryopteris Filix-mas*).	.850 (1)	....	....
11	**Mandarin:** (*Citrus madurensis*).	.850–.858 (1)	+65 to +75 (1)	....
12	**Marjoram:** (*Origanum majorana*).	.890–.910 (6)	+5 to +18 (6)	1 pt. in 2 of 80%
13	**Mastic:** (*Pistacia lentiscus*).	.858–.868 (1)	+22 to +28 (1)	....
14	**Matico** (leaves): (*Piper augustifolium*).	.930–1.130 (3)	+5.5 to −0.25 (6)	equal part 90%
15	**Monarda:** (*Monarda punctata*).	.930–.940 (2)	slightly + (2)	....
16	**Mustard:** (*Brassica nigra* and *B. juncea*).	1.016–1.030 (6) [1.013–1.020 (25°) (5)]	....	1 pt. in 10 of 70%
17	**Myrrh:** (Species of *Commiphora*).	.988–1.007 (6)	−67° 54′ to 90° (6)	1 pt. in 10 of 90%
18	**Myrtle:** (*Myrtus communis*).	.890–.920 (2)	+10 to +30 (1)	....
19	**Neroli:** (*Citrus bigaradia*).	.870–.880 (6)	slightly dextrogyrate to +5 (6)	1 pt. in 2 of 80%
20	**Nutmeg:** (*Myristica fragrans*).	.865–.930 (1) [.884–.924 (25°) (5)]	+8 to +28 (1)	1 pt. in 3 of 90%

‡ East Indian. § West Indian.

No.	Other Characters.	Chief Known Constituents.
1	Contains 70–75% citral. Refractive index 1.483–1.488 (20°) (3).	Citral; geraniol; methyl heptenone.
2	Refractive index (20°) 1.480–1.4846 (3)	*d*-limonene; citral; methyl anthranilate.
3	Refractive index (20°) 1.4750–1.4770 (3). Boils 175–220 (1).	*d*-limonene.
4	Sapon. value 75 (6). Ref. ind. 1.477 (20°) (3).	*d*-limonene; citral; linalyl acetate.
5	....	Citral; "limene" ($C_{15}H_{24}$).
6	Sapon. value 1–10 (1). Refractive index (20°) 1.4638 (1).	Linalol; geraniol; methyl heptenone.
7	....	Mostly linalol.
8	....	*d*-terpineol; a terpene.
9	Refractive index 1.476–1.484 (20°) (3).........	Pinene; dipentene; myristicin.
10	Boils 140–250° (1)...........................	Hexyl and octyl esters of fatty acids.
11	Boils 175–179° C. (6)........................	Limonene; citral; methyl ester of methyl anthanilate.
12	Sapon. value 21.5 † (6).....................	Terpineol; terpenes.
13	Boils 155–160° (1)...........................	*d*-pinene.
14	....	Asarone; possibly methyl eugenol (1).
15	Strong thyme-like odor	Thymol; cymol.
16	Boils 148–154° C. Warmed with ammonia water it produces thiosinamine. Should give on distillation the same sp. gr. with first and last of distillate. Ref. ind. 1.525–1.535 (20°) (3).	Allyl-iso-thiocyanate [not less than 92% (5)].
17	Boils 220–325° (6)...........................	....
18	....	Pinene; cineol; dipentene.
19	Sapon. value 20–52 (1). Shaken with saturated sodium bisulphite assumes a permanent purplish color. Ref. ind. (20°) 1.4755.	Linalyl acetate; linalol; geraniol; limonene.
20	Evaporated on water bath should leave no crystalline residue on cooling. Refractive index (20°) 1.476 (3).	Myristicin; pinene.

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Olibanum:** (*Boswellia Carterii*).	.875–.885 (6)	−11 to −17 (6)	....
2	**Onion:** (*Allium cepa*)...	1.035–1.045 (3)	about −5 (1)	....
3	**Orange** (Sweet): (*Citrus aurantium*). (Bitter *C. bigaradia*).	.848–.857 (1) .842–.846 (25°) (5)	+95 to +99 (1) (bitter orange) +90 to +93)	1 pt. in 4 of 95% with faint turbidity
4	**Origanum** (Triest): (*Origanum hirtum*).	.940–.980 (1)	±0 to slightly −	1 pt. in 3 of 70%
5	(Smyrna). (*Origanum smyrnæum*).	.915–.966 (3)	0 to −15 (3)	1 pt. in 3 of 70%
6	**Origanum vulgare:**	.870–.910 (6)	−34.5 (6)	....
7	**Orris:** (Species of *Iris*).	....	slightly dextrogyrate	....
8	**Opopanax:** (*Commiphora katof*).	.870–.905 (1)	−10 to −12 (1)	equal part 90%
9	**Palmarosa:** (*Andropogon Schaenanthus*).	.885–.896 (1 & 4)	+1.8 to −1.7 (1) [+1 to −1(4)]	1 pt. in 3 of 70%
10	**Parsley** (leaves): (*Petroselinum sativum*).	.900–.925 (1)	+16′ to +3° 10′ (1)	....
11	(seed).............	1.05–1.10 (1)	slightly lævogyrate	....
12	**Patchouli:** (*Pogostemon patchouli*).	.970–.995 (1)	−50 to −68	equal part 90%
13	**Pennyroyal** (American): (*Hedeoma pulegioides*).	.925–.940 (1) [.920–.935 (25°) (5)]	+18 to +22 (1 and 5) [+25.7† (1)]	1 pt. in 2 of 70%
14	(European): (*Mentha pulegium*).	.930–.960 (1)	+17 to +23 (1)	1 pt. in 2 of 70%
15	**Pepper** (Black): (*Piper nigrum*).	.870–.900 (6) [.930 (4)]	−5 to +2 (6) [−8.5 (4)]	1 pt. in 15 of 90%
16	**Peppermint:** (*Mentha piperita*).	.894–.914 (25°) (5)	−20 to −33 (25°) (5)	1 vol. in 4 of 70% (5)
17	(American)........	.905–.920 (2)	−18 to −33 (2)	½ or more vol. 90%
18	(English).........	.900–.910 (2)	−22 to −33 (2)	.....do........
19	(French)..........	.910–.921 (1)	−6 to −35 (1)	.....do........
20	(Russian).........	.905–.915 (2)	−17 to −22 (2)	.....do........
21	(German).........	.900–.915 (2)	−25 to −33 (2)	.....do........
22	(Italian †)........	.912 (2)	−16.3 (2)	.....do........
23	(Japanese)........ (*Mentha arvensis*).	.895–.900 (24°)	−25 to −43 (2)	.....do........

No.	Other Characters.	Chief Known Constituents.
1	....	Pinene; phellandrene; dipentene.
2	....	Allyl-propyl disulphide.
3	Refractive index 1.4730–1.4740 (20°)..........	Chiefly limonene.
4	Contains 60–85% carvacrol. Gives violet color with ferric chloride.	Carvacrol; cymene.
5	Contains 25–60% carvacrol. Color with ferric chloride not so intense as last. Refractive index 1.510 (20°) (3).	Carvacrol; linalol; cymene.
6	Distils mostly at 161° C. (6)..........	Carvacrol (?); phenols.
7	Melting point 44–50° C. (6). Sapon. value 2–6. Acid value 213–222.	Myristic and oleic acid and their methyl esters; irone.
8	Boils between 250–300° (6)..........	....
9	Refractive index (20°) 1.4760–1.4805 (3). Sapon. value 20–40 (1); after acetylization 230–270 (1).	Geraniol; geranyl acetate and capronate; dipentene.
10	Strong odor of parsley. Greenish yellow color. Refractive index (20°) 1.489 (3).	Apiol (small amount).
11	German oil semi-solid at ordinary temperatures, French oil on cooling.	Apiol; pinene.
12	(These values were obtained on oils distilled in Europe.) Singapore oils, probably sophisticated, give lower sp. gr., and optical rotation.	Patchouly alcohol; *p*-camphor; eugenol; cinnamic aldehyde.
13	....	Pulegone; hedeomol.
14	About 80% distils between 212–216° C., and only about 5% below 212°. Refractive index (20°) 1.4805 (3).	Pulegone.
15	....	Phellandrene; dipentene.
16	Not less than 6% esters (menthyl ester) and 50% total menthol (5). Ref. ind. (20°) 1.4650.	Seventeen bodies have been identified in American oil, chief of which are: Menthol; esters of menthol; menthone; pinene; cineol; phellandrene; limonene; cadinene. Other oils probably have many of the same constituents.
17	Refractive index (20°) about 1.4635 (2). Solidifies in freezing mixture. Total menthol 48–64%.	
18	Deposits a few crystals on long standing in freezing mixture. Total menthol 51–66%.	
19	Total menthol 45–69%.	
20	Acts like English oil on cooling. Total menthol about 50%.	
21	Acts like English oil on cooling. Total menthol 55–68%.	
22	Deposits no crystals on cooling. Refractive index 1.4680 at 16°. Total menthol 55.5%.	
23	Solidifies +17 to +28° C. Total menthol 70–91%.	

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Petit-grain:** (*Citrus bigaradia*).	.887–.900 (1)	+3.7 to −1.3(1) [−6.25 from leaves only (12)]	1 pt. in 2 of 80%
2	**Petit-grain citronier:** (*Citrus medica*).	.869–.874 (1) .878 (4)	+22 to +34 (1) +9.4 (4)	. . . .
3	**Pine-needles:** (*various conifers*).	.853–.875 (1) (P. sylvestris .905) (P. cembra .920)	−5 to −76 (1) (P. sylvestris +10.7 to −19) (P. cembra +29)	1 pt. in 5–6 of 90%
4	**Poplar buds:** (*Populus nigra*).	.895–.905 (6)	+1 to +5 (6)	1 pt. in ½ of 95%
	Rose: (*Rosa damascena*)			
5	(Bulgarian)	(1) .849–.860 (30°)	lævogyrate to −4 (1)	. . . .
6	(German)	(1) .845–.855 (30°)	+1 to −1 (1)	. . . .
7	(U. S. Pharm.)	.855–.865 (25°)	. . . .	. . . .
8	**Rosemary:** (*Rosmarinus officinalis*).	.896–.920 (2)	−9 to +18 (3) (English oil −9.5 †)	equal pt. 90%
9	**Rue:** (*Ruta graveolens*) .	.833–.840 (1) (Algerian oil .842)	+0.2 to +2 (1) (Algerian oil +5)	1 pt. in 2–3 of 70%
10	**Sage:** *Salvia officinalis* . .	.915–.925 (1)	+10 to +25 (1)	1 pt. in 2 of 80%
11	**Sandal-Wood:** (East Indian). (*Santalum album*).	.970–.985 (1) .971–.982 (4)	−17 to −19 (1) [−16 to −20 (25°) (5)]	1 pt. in 5 of 70%
12	(West Indian). (*Amyris balsamifera*).	.960–.967 (6)	+24 to +29 (6)	. . . .
13	(West Australian).	.953	+5.3	. . . .
14	**Sassafras** (Bark): (*Sassafras officinalis*).	1.065–1.095 (2) [1.070–1.080 (1)]	+1 to +4 (2) [+3 to +4 (1)]	All proportions of 90%
15	**Savin:** (*Juniperus sabina*)	.910–.930 (1) .903–.923 (25°) (5)	+42 to +60 (1) +40 to +60 (25°) (5)	equal part 95%
16	**Schinus:** (*Schinus molle*)	.850 (1)	+46 (17°) (1)	1 pt. in 3.3 of 90%
	Spearmint: (*Mentha viridis*).			
17	(American)	.920–.940 (1) ‡	−36 to −48 (1)	equal part 90%
18	(Russian) . . . . (*botan. source (?)*).	.883–.885 (6)	−23 (6)	1 pt. in 2 of 70%

‡ Two authentic samples .961 and .980.

No.	Other Characters.	Chief Known Constituents.
1	Refractive index (20°) 1.4623 (3). Sapon. value 110–245 (1).	Linalyl acetate; linalol; limonene; a sesquiterpene.
2	Contains oil from unripe fruit	Esters of linalol; citral.
3	Boils 150–185° C. Leaves considerable residue at 185° C. Less than 10% volatile below 160°.	*l*-pinene; *l*-limonene; bornyl acetate.
4	Sapon. value 13 (1). Boils 255–265 (6)	Humulene and another sesquiterpene; a paraffin.
5	Congeals below 23° C. Sapon. value 10–17. Acid value 0.5–3. Refractive index (25°) 1.452–1.464. Geraniol 66–74% (1).	Geraniol; citronellol; stearoptene.
6	Congeals +27 to +37° C. (1). Stearoptene 26–34%.	
7	Congeals 18–22° C. Sapon. value 10–17......	
8	Sapon. value 12–20 (1). First 10% distillate should also be dextrogyrate. Not less than 2.5% bornyl acetate and 10% total borneol (5).	Pinene; camphene; cineol; camphor; borneol; bornyl acetate.
9	Refractive index (20°) 1.4341 (3). Solidifies +8 to 10°. Most of it volatile 215–232°, not more than 5% below 200°.	Methyl-nonyl-ketone; lauric aldehyde.
10	Sapon. value 107 (1)	Cineol; thujone; pinene.
11	Sapon. value 5–15 (1). Not less than 90% alcohols as santalol (5). Refractive index (20°) 1.505–1.510 (3).	Santal alcohols; santalol; esters of santal alcohols.
12	....	....
13	....	....
14	Five drops of oil cooled and mixed with 5 drops conc. nitric acid produce first a red coloration, then a resin.	Safrol; eugenol; camphor; pinene; phellandrene.
15	Sapon. value 115–125 (1). Not more than 25% volatile below 250° C.	Sabinol; sabinol acetate; cadinene; pinene.
16	....	Phellandrene; pinene; carvacrol.
17	Carvone about 56% (6).....................	Carvone; limonene; pi- [nene.
18	Sapon. value 25.9 (6). Carvone 5–10%. Linalol 50–60% (6).	Linalol; citral; cineol carvone; limonene.

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Storax:** (*Liquidambar orientale*).	.890–1.100 (1)	−3 to −38 (6)	....
2	**Tansy:** (*Tanacetum vulgare*).	.925–.955 (6) [Fresh herb .915 to .930 (2)]	+30 to +45 (1) [English oil −27.5 (2)]	....
3	**Tar:** (Species of *Pinus*).	.862–.872 (6) [about .892 (25°) (5)]	+15 to +24 (6)	sol. in 95%
4	**Tarragon:** (*Artemisia Dracunculus*).	.900–.949 (13) .890–.960 (1)	+2 to +9 (1)	1 pt. in 10 of 80%
5	**Thuja** (Leaves): (*Thuja occidentalis*).	.915–.925 (3)	−5 to −14 (6)	1 pt. in 3–4 of 70%
6	**Thyme:** (*Thymus vulgaris*).	.900–.930 (25°) (5)	not more than −3 (25°) (5)	1 pt. in 1–2 of 80% (5)
7	(French)..........	.905–.915 (1)	slightly lævogyrate (1)	1 pt. in 2 of 80%
8	(German).........	.909–.935 (1)	slightly lævogyrate (1)	1 pt. in 2 of 80%
9	(Spanish).........	....	....	....
10	(Botanical source (?)).	.930–.950 (6)	....	1 pt. in 2–3 of 70%
11	**Thyme** (Wild): (*Thymus serpyllum*).	.890–.920 (6) .905–.930 (2)	−10 to −21 (6) −1 to −11 (2)	....
12	**Tolu:** (*Toluifera balsamum*).	.945–1.09(6)	−1 to +1 (6)	....
13	**Turpentine:**	.860–.870(25°)(5)	....	1 pt. in 3 of 95% (5)
14	(*Various conifers*).	.862–.875 (20°) (10)	−34.8 to +29.6 (2)	....
15	("Wood" Turpentine)	.855–.910 (20°) (10)	....	....
16	**Valerian:** (*Valeriana officinalis*)	.930–.955 (2)	−8 to −15 (2)	....
17	(Japanese)........ (*V. officinalis, var. augustifolia*).	.990–.996 (1)	−8 to −15 (2)	....
18	**Verbena:** † (*Lippia citriodora*).	.900 (1)	−12° 38′ (1)	1 pt. in 5 of 90%
	Verti-vert: (*Andropogon muricatus*).			
19	(German).........	1.015–1.030 (1)	about +27 (1)	1 pt. in 2 of 80%
20	(Réunion)........	(30°) .982–.998 (1)	+29 to +36 (1)	1 pt. in 2 of 80%

No.	Other Characters.	Chief Known Constituents.
1	Boils 150–300° C. (American Storax, *L. styraciflluum*, dextrogyrate, about +16.)	Styrene; cinnamic esters.
2	....	Thujone; camphor; borneol.
3	....	....
4	Refractive index (15°) 1.5165–1.5170 (13).....	Methyl-clavicol.
5	....	*d*-pinene; *l*-fenchone; thujone.
6	Contains not less than 20% phenols (5). Ref. ind. (20°) 1.480–1.490 (3).	....
7	Contains 20–25% phenols, sometimes as much as 42%.	Thymol; carvacrol; cymene; linalol; borneol.
8	Like the French oil.	
9	....	....
10	Contains 50–70% phenols (6)	Carvacrol (no thymol).
11	Distils mostly 175–180° (6)	Thymol; carvacrol.
12	Saponification value about 180 (6)...........	Esters of benzoic and cinnamic acid.
13	Most of the oil distils 155–162° (5). Less than 2% residue at 100° (2).	Pinene; sylvestrene; dipentene.
14	Refractive index (20°) 1.4690–1.4740 (10). Less than 5% is left unpolymerized with conc. sulphuric acid after standing 30 min.; about 90% distils 156–180°.	
15	Refractive index (20°) 1.4685–1.4750 (10). Usually has a tarry odor. Less than 90% distils below 165° (2).	
16	Boils 250–300° (2). Acid value 20–50. Ester value 80–100. Sapon. value 100–150 (6).	Borneol; bornyl formate, acetate and isovalerianate; pinene; camphene.
17	Has a green color, but similar to European oil in other organoleptic properties.	Same as European oil but contains also kessyl acetate.
18	....	....
19	Sapon. value 60–80. Most viscid of all essential oils.	....
20	....	....

No.	Oil and Chief Botanical Source.	Specific Gravity, 15° C.	Optical Rotation, 100 mm.*	Solubility in Alcohol.
1	**Wintergreen:** (*Gautheria procumbens*).	1.175–1.187 (2) 1.172–1.180 (25°) (5)	−0.45 to −1.0 (1)	1 pt. in 6 of 70%
2	**Wormseed** (American): (*Chenopodium ambrosioides*).	about 0.970 (2) .965–.985 (25°) (5)	−5 to −18 (2)	1 pt. in 10 of 70%
3	**Wormseed** (Levant) .... (*Artemisia maritima*).	.930–.935 (2) [.915–.940 (6)]	slightly lævogyrate	....
4	**Wormwood:** (*Artemisia absinthium*).	.925–.955 (2)	....	1 pt. in 2–4 of 80%
5	**Ylang Ylang:** (Manila) (*Cananga odorata*).	.911–.958 (30°) (1)	−27 to −49.7 (30°) (1)	....
6	**Zedoary:** (*Curcuma Zedoaria*).	.990–1.010 (6)	....	1 pt. in 2 of 80%

No.	Other Characters.	Chief Known Constituents.
1	Boils 218–221°..............................	Methyl salicylate about 99%.
2	Penetrating odor and bitter taste. Varies in properties with age.	....
3	....	Cineol.
4	First 10% of distillate should be soluble in 2 vols. 80% alcohol. Has green color when distilled from green herb. Refractive index (20°) 1.460–1.470 (3).	Thujone and its acetate; phellandrene; thujyl alcohol.
5	Sapon. value 90–138 (1). Refractive index (30) 1.4747–1.4940.	Linalol; geraniol and their esters; pinene.
6	Viscid, very dark oil. Distils mostly 240–300°.	Cineol; a crystalline body melting at 142.5°.

XXXIII.—MELTING POINT AND COMPOSITION OF FUSIBLE ALLOYS *

Melting Point, °C.	Percentage Composition.				Observer or Special Name.
	Lead.	Tin.	Bismuth.	Cadmium.	
55.5	25.00	12.50	50.00	12.50	....
55.5	12.00	16.00	60.00	12.00	....
60–68	26.70	13.30	50.00	10.00	Lipowitz.
65.5	25.00	12.50	50.00	12.50	Wood.
65.5	12.00	16.00	60.00	12.00	....
65.5	24.90	14.20	51.00	10.80	....
67.5	25.21	14.10	51.07	9.60	Wood. von Hauer.
68.5	24.24	13.65	49.09	13.09	v. Hauer.
68.5	25.94	14.51	52.53	7.00	v. Hauer. Newton.
65–71	30.77	15.38	38.77	15.38	Silliman.
65–71	25.00	12.50	50.00	12.50	Wood.
70	28.60	14.30	50.00	7.10	Wood.
70	27.19	12.91	50.09	9.81	Wood.
72	29.66	8.80	54.94	6.60	....
75	27.60	10.30	27.60	34.50	....
75.5	25.80	14.70	52.40	7.00	Wood.
75.5	25.00	14.20	50.70	10.10	Lipowitz.
76.5	34.38	9.37	50.00	6.25	v. Hauer. Lipowitz-Eratz.
76.6	27.27	18.18	45.46	9.09Hg.	
77.0	29.41	17.65	47.06	5.88	....
80.0	25.00	25.00	43.75	6.25	Harper.
80.0	21.43	21.43	57.14	....	d'Arcet.
80.0	35.15	20.03	35.31	9.51	....
82.0	42.86	....	50.00	7.14	Wood.
88.0	42.86	....	50.00	7.14	n. v. Hauer.
89.5	39.52	....	53.36	7.11	v. Hauer.
89.5	50.00	....	33.33	16.67	....
89.5	33.33	....	50.00	16.67	....
90.0	34.97	29.90	35.13	....	Rose.
90.0	31.25	18.75	50.00	....	d'Arcet.
91.6	30.00	20.00	50.00	....	Onions. Lichtenberg.
91.6	32.73	12.44	54.83	....	Lichtenberg.
92–93	18.45	31.55	50.00	....	v. Hauer.
93.0	25.00	25.00	50.00	....	Erman. Rose.
93.0	18.75	31.25	50.00	....	Newton. Melotte.
93.75	27.94	15.92	56.16	....	Rose.
94.0	16.67	16.67	66.66	....	....
94.0	42.10	15.80	42.10	....	Rose.

* Chem. Ztg., **30**, 1139–1143. Jour. Soc. Chem. Ind., **25**, 1221.

Melting Point, °C.	Percentage Composition.				Observer or Special Name.
	Lead.	Tin.	Bismuth.	Cadmium.	
94.0	27.50	45.00	27.50	....	Bismuth solder.
94.44	33.90	11.60	54.50	....	Newton.
94.5	50.00	30.00	20.00	....	Newton.
95.0	....	33.33	50.00	16.67	v. Hauer.
95.0	....	30.00	50.00	20.00	v. Hauer.
95.0	....	33.33	55.56	11.11	....
95.0	....	25.00	50.00	25.00	Wood, v. Hauer.
95.0	43.26	....	50.06	6.67	v. Hauer.
95.0	58.33	....	33.33	8.34	....
95.0	30.77	....	53.84	15.39	....
95.0	33.13	32.15	....	34.40	....
95.0	32.49	18.51	49.00	....	d'Arcet.
95.0	25.00	25.00	50.00	....	Rose.
98.0	31.25	18.75	50.00	....	Newton, d'Arcet.
98.75	45.10	9.60	45.30	....	d'Arcet.
98.8	24.00	27.30	48.70	....	Rose.
99.0	33.34	33.33	33.33	....	....
100.0	50.00	30.00	20.00	....	....
100.0	16.67	41.67	41.66	....	Newton.
100.0	25.00	25.00	50.00	....	Smith.
104.0	26.33	7.51	66.16	....	Krafft.
105.0	26.67	44.76	23.81	4.76	v. Hauer.
111.0	40.00	20.00	40.00	....	Bismuth solder.
119.0	48.39	38.71	12.90	....	....
122.0	39.28	21.25	39.47	....	Homberg.
123.3	33.33	33.33	33.34	....	....
123.75	41.67	25.00	33.33	....	....
124.0	38.84	22.14	39.02	....	....
124.0	42.86	42.86	14.28	....	....
125.3	27.20	....	72.80	....	Rudberg.
127.0	42.74	....	57.26	....	....
128.0	44.45	44.44	11.11	....	....
130.0	38.46	30.77	30.77	....	....
132.0	28.00	47.00	....	25.00	v. Hauer.
136.0	34.36	57.64	....	8.00	v. Hauer.
136.0	26.47	59.32	....	14.30	v. Hauer.
136.0	20.43	68.54	....	11.03	v. Hauer.
136.4	....	29.80	70.20	....	Rudberg.
140.0	....	68.29	31.71	....	....
140.0	33.33	33.33	33.34	....	....
140.0	42.10	36.84	21.06	....	....
145.0	48.25	27.50	24.25	....	....
145.0	50.00	30.00	20.00	....	....
146.3	....	....	78.80	21.20	Rudberg.
149.0	25.00	50.00	....	25.00	....
150.0	40.74	44.44	14.82	....	....
155.0	42.86	42.86	14.28	....	Bismuth solder.

Melting Point, °C.	Percentage Composition.				Observer or Special Name.
	Lead.	Tin.	Bismuth.	Cadmium.	
155.0	52.50	30.00	17.50	....	....
160.0	53.57	32.14	14.29	....	....
160.0	42.10	47.37	10.52	....	....
160.0	44.45	44.44	11.11	....	Bismuth solder.
160.0	31.80	36.20	32.00	....	....
165.0	....	75.65	....	24.35	v. Hauer.
168.0	40.00	60.00	....	....	Prechtl, tin solder.
168.0	26.90	68.90	....	4.20Zn	Svanberg.
171.0	33.33	66.67	....	....	soft quick solder.
173.8	....	....	67.80	32.20	Rudberg.
175	89.77	10.23	....	....	Spring.
175	87.53	12.47	....	....	Spring.
176.5	77.82	22.18	....	....	Spring.
177.0	84.03	15.97	....	....	Spring.
177.5	63.70	36.30	....	....	Spring.
179.0	36.90	63.10	....	....	Spring.
180.0	25.00	75.00	....	....	Prechtl.
180.0	37.00	63.00	....	....	Drop solder.
181.0	37.35	62.65	....	....	Pillichody.
181.0	51.28	48.72	....	....	....
181.2	55.64	44.36	....	....	Pohl.
183.0	30.50	69.50	....	....	Spring.
185.0	46.73	53.27	....	....	....
186.0	37.50	62.50	....	....	....
186.0	20.00	80.00	....	....	Prechtl.
187.0	31.00	69.00	....	....	....
187.0	33.33	66.67	....	....	....
187.0	30.50	69.50	....	....	Pillichody.
189.0	63.70	36.30	....	....	....
189.0	50.00	50.00	....	....	Prechtl quick solder.
189.0	81.40	18.60	....	....	....
189.0	71.43	28.57	....	....	....
190.0	22.62	77.38	....	....	....
190.0	41.23	58.77	....	....	....
192.0	16.67	83.33	....	....	Prechtl.
194.0	14.30	85.70	....	....	Prechtl.
194.0	23.08	76.91	....	....	....
194.0	25.00	75.00	....	....	....
194.0	28.58	71.42	....	....	....
194–195	84.00	16.00	....	....	....
194–195	75.00	25.00	....	....	....
197.0	47.20	52.80	....	....	Pillichody.
197	54.34	45.66	....	....	....
198.0	86.00	14.00	....	....	....
198.0	77.78	22.22	....	....	....
200.0	63.70	36.30	....	....	....
200.0	50.00	50.00	....	....	....

XXXIV (a).—EQUIVALENT OF DEGREES BAUMÉ (AMERICAN STANDARD) AND SPECIFIC GRAVITY AT 60° F.

$$\text{Degrees Baumé} = 145 - \frac{145}{\text{Sp. Gr.}}$$ For Liquids Heavier than Water.

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
0.0	1.0000	.7	1.0262	.4	1.0538	.1	1.0829
.1	1.0007	.8	1.0269	.5	1.0545	.2	1.0837
.2	1.0014	.9	1.0276	.6	1.0553	.3	1.0845
.3	1.0021	4.0	1.0284	.7	1.0561	.4	1.0853
.4	1.0028	.1	1.0291	.8	1.0569	.5	1.0861
.5	1.0035	.2	1.0298	.9	1.0576	.6	1.0870
.6	1.0042	.3	1.0306	8.0	1.0584	.7	1.0878
.7	1.0049	.4	1.0313	.1	1.0592	.8	1.0886
.8	1.0055	.5	1.0320	.2	1.0599	.9	1.0894
.9	1.0062	.6	1.0328	.3	1.0607	12.0	1.0902
1.0	1.0069	.7	1.0335	.4	1.0615	.1	1.0910
.1	1.0076	.8	1.0342	.5	1.0623	.2	1.0919
.2	1.0083	.9	1.0350	.6	1.0630	.3	1.0927
.3	1.0090	5.0	1.0357	.7	1.0638	.4	1.0935
.4	1.0097	.1	1.0365	.8	1.0646	.5	1.0943
.5	1.0105	.2	1.0372	.9	1.0654	.6	1.0952
.6	1.0112	.3	1.0379	9.0	1.0662	.7	1.0960
.7	1.0119	.4	1.0387	.1	1.0670	.8	1.0968
.8	1.0126	.5	1.0394	.2	1.0677	.9	1.0977
.9	1.0133	.6	1.0402	.3	1.0685	13.0	1.0985
2.0	1.0140	.7	1.0409	.4	1.0693	.1	1.0993
.1	1.0147	.8	1.0417	.5	1.0701	.2	1.1002
.2	1.0154	.9	1.0424	.6	1.0709	.3	1.1010
.3	1.0161	6.0	1.0432	.7	1.0717	.4	1.1018
.4	1.0168	.1	1.0439	.8	1.0725	.5	1.1027
.5	1.0175	.2	1.0447	.9	1.0733	.6	1.1035
.6	1.0183	.3	1.0454	10.0	1.0741	.7	1.1043
.7	1.0190	.4	1.0462	.1	1.0749	.8	1.1052
.8	1.0197	.5	1.0469	.2	1.0757	.9	1.1060
.9	1.0204	.6	1.0477	.3	1.0765	14.0	1.1069
3.0	1.0211	.7	1.0484	.4	1.0773	.1	1.1077
.1	1.0218	.8	1.0492	.5	1.0781	.2	1.1086
.2	1.0226	.9	1.0500	.6	1.0789	.3	1.1094
.3	1.0233	7.0	1.0507	.7	1.0797	.4	1.1103
.4	1.0240	.1	1.0515	.8	1.0805	.5	1.1111
.5	1.0247	.2	1.0522	.9	1.0813	.6	1.1120
.6	1.0255	.3	1.0530	11.0	1.0821	.7	1.1128

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
.8	1.1137	.2	1.1526	.6	1.1944	28.0	1.2393
.9	1.1145	.3	1.1535	.7	1.1954	.1	1.2404
15.0	1.1154	.4	1.1545	.8	1.1964	.2	1.2414
.1	1.1162	.5	1.1554	.9	1.1974	.3	1.2425
.2	1.1171	.6	1.1563	24.0	1.1983	.4	1.2436
.3	1.1180	.7	1.1572	.1	1.1993	.5	1.2446
.4	1.1188	.8	1.1581	.2	1.2003	.6	1.2457
.5	1.1197	.9	1.1591	.3	1.2013	.7	1.2468
.6	1.1206	20.0	1.1600	.4	1.2023	.8	1.2478
.7	1.1214	.1	1.1609	.5	1.2033	.9	1.2489
.8	1.1223	.2	1.1619	.6	1.2043	29.0	1.2500
.9	1.1232	.3	1.1628	.7	1.2053	.1	1.2511
16.0	1.1240	.4	1.1637	.8	1.2063	.2	1.2522
.1	1.1249	.5	1.1647	.9	1.2073	.3	1.2532
.2	1.1258	.6	1.1656	25.0	1.2083	.4	1.2543
.3	1.1267	.7	1.1665	.1	1.2093	.5	1.2554
.4	1.1275	.8	1.1675	.2	1.2104	.6	1.2565
.5	1.1284	.9	1.1684	.3	1.2114	.7	1.2576
.6	1.1293	21.0	1.1694	.4	1.2124	.8	1.2587
.7	1.1302	.1	1.1703	.5	1.2134	.9	1.2598
.8	1.1310	.2	1.1712	.6	1.2144	30.0	1.2609
.9	1.1319	.3	1.1722	.7	1.2154	.1	1.2620
17.0	1.1328	.4	1.1731	.8	1.2164	.2	1.2631
.1	1.1337	.5	1.1741	.9	1.2175	.3	1.2642
.2	1.1346	.6	1.1750	26.0	1.2185	.4	1.2653
.3	1.1355	.7	1.1760	.1	1.2195	.5	1.2664
.4	1.1364	.8	1.1769	.2	1.2205	.6	1.2675
.5	1.1373	.9	1.1779	.3	1.2216	.7	1.2686
.6	1.1381	22.0	1.1789	.4	1.2226	.8	1.2697
.7	1.1390	.1	1.1798	.5	1.2236	.9	1.2708
.8	1.1399	.2	1.1808	.6	1.2247	31.0	1.2719
.9	1.1408	.3	1.1817	.7	1.2257	.1	1.2730
18.0	1.1417	.4	1.1827	.8	1.2267	.2	1.2742
.1	1.1426	.5	1.1837	.9	1.2278	.3	1.2753
.2	1.1435	.6	1.1846	27.0	1.2288	.4	1.2764
.3	1.1444	.7	1.1856	.1	1.2299	.5	1.2775
4	1.1453	.8	1.1866	.2	1.2309	.6	1.2787
.5	1.1462	.9	1.1876	.3	1.2319	.7	1.2798
.6	1.1472	23.0	1.1885	.4	1.2330	.8	1.2809
.7	1.1481	.1	1.1895	.5	1.2340	.9	1.2821
.8	1.1490	.2	1.1905	.6	1.2351	32.0	1.2832
.9	1.1499	.3	1.1915	.7	1.2361	.1	1.2843
19.0	1.1508	.4	1.1924	.8	1.2372	.2	1.2855
.1	1.1517	.5	1.1934	.9	1.2383	.3	1.2866

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
.4	1.2877	.8	1.3401	.2	1.3969	.6	1.4588
.5	1.2889	.9	1.3414	.3	1.3983	.7	1.4602
.6	1.2900	37.0	1.3426	.4	1.3996	.8	1.4617
.7	1.2912	.1	1.3438	.5	1.4010	.9	1.4632
.8	1.2923	.2	1.3451	.6	1.4023	46.0	1.4646
.9	1.2935	.3	1.3463	.7	1.4037	.1	1.4661
33.0	1.2946	.4	1.3476	.8	1.4050	.2	1.4676
.1	1.2958	.5	1.3488	.9	1.4064	.3	1.4691
.2	1.2970	.6	1.3501	42.0	1.4078	.4	1.4706
.3	1.2981	.7	1.3514	.1	1.4091	.5	1.4721
.4	1.2993	.8	1.3526	.2	1.4105	.6	1.4736
.5	1.3004	.9	1.3539	.3	1.4119	.7	1.4751
.6	1.3016	38.0	1.3551	.4	1.4133	.8	1.4766
.7	1.3028	.1	1.3564	.5	1.4146	.9	1.4781
.8	1.3040	.2	1.3577	.6	1.4160	47.0	1.4796
.9	1.3051	.3	1.3590	.7	1.4174	.1	1.4811
34.0	1.3063	.4	1.3602	.8	1.4188	.2	1.4826
.1	1.3075	.5	1.3615	.9	1.4202	.3	1.4841
.2	1.3087	.6	1.3628	43.0	1.4216	.4	1.4857
.3	1.3098	.7	1.3641	.1	1.4230	.5	1.4872
.4	1.3110	.8	1.3653	.2	1.4244	.6	1.4887
.5	1.3122	.9	1.3666	.3	1.4258	.7	1.4902
.6	1.3134	39.0	1.3679	.4	1.4272	.8	1.4918
.7	1.3146	.1	1.3692	.5	1.4286	.9	1.4933
.8	1.3158	.2	1.3705	.6	1.4300	48.0	1.4948
.9	1.3170	.3	1.3718	.7	1.4314	.1	1.4964
35.0	1.3182	.4	1.3731	.8	1.4328	.2	1.4979
.1	1.3194	.5	1.3744	.9	1.4342	.3	1.4995
.2	1.3206	.6	1.3757	44.0	1.4356	.4	1.5010
.3	1.3218	.7	1.3770	.1	1.4371	.5	1.5026
.4	1.3230	.8	1.3783	.2	1.4385	.6	1.5041
.5	1.3242	.9	1.3796	.3	1.4399	.7	1.5057
.6	1.3254	40.0	1.3810	.4	1.4414	.8	1.5073
.7	1.3266	.1	1.3823	.5	1.4428	.9	1.5088
.8	1.3278	.2	1.3836	.6	1.4442	49.0	1.5104
.9	1.3291	.3	1.3849	.7	1.4457	.1	1.5120
36.0	1.3303	.4	1.3862	.8	1.4471	.2	1.5136
.1	1.3315	.5	1.3876	.9	1.4486	.3	1.5152
.2	1.3327	.6	1.3889	45.0	1.4500	.4	1.5167
.3	1.3329	.7	1.3902	.1	1.4515	.5	1.5183
.4	1.3352	.8	1.3916	.2	1.4529	.6	1.5199
.5	1.3364	.9	1.3929	.3	1.4544	.7	1.5215
.6	1.3376	41.0	1.3942	.4	1.4558	.8	1.5231
.7	1.3389	.1	1.3956	.5	1.4573	.9	1.5247

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
50.0	1.5263	.4	1.6004	.8	1.6821	.2	1.7726
.1	1.5279	.5	1.6022	.9	1.6841	.3	1.7748
.2	1.5295	.6	1.6040	59.0	1.6860	.4	1.7770
.3	1.5312	.7	1.6058	.1	1.6880	.5	1.7791
.4	1.5328	.8	1.6075	.2	1.6900	.6	1.7813
.5	1.5344	.9	1.6093	.3	1.6919	.7	1.7835
.6	1.5360	55.0	1.6111	.4	1.6939	.8	1.7857
.7	1.5376	.1	1.6129	.5	1.6959	.9	1.7879
.8	1.5393	.2	1.6147	.6	1.6979	64.0	1.7901
.9	1.5409	.3	1.6165	.7	1.6999	.1	1.7923
51.0	1.5426	.4	1.6183	.8	1.7019	.2	1.7946
.1	1.5442	.5	1.6201	.9	1.7039	.3	1.7968
.2	1.5458	.6	1.6219	60.0	1.7059	.4	1.7990
.3	1.5475	.7	1.6237	.1	1.7079	.5	1.8012
.4	1.5491	.8	1.6256	.2	1.7099	.6	1.8035
.5	1.5508	.9	1.6274	.3	1.7119	.7	1.8057
.6	1.5525	56.0	1.6292	.4	1.7139	.8	1.8080
.7	1.5541	.1	1.6310	.5	1.7160	.9	1.8102
.8	1.5558	.2	1.6329	.6	1.7180	65.0	1.8125
.9	1.5575	.3	1.6347	.7	1.7200	.1	1.8148
52.0	1.5591	.4	1.6366	.8	1.7221	.2	1.8170
.1	1.5608	.5	1.6384	.9	1.7241	.3	1.8193
.2	1.5625	.6	1.6403	61.0	1.7262	.4	1.8216
.3	1.5642	.7	1.6421	.1	1.7282	.5	1.8239
.4	1.5659	.8	1.6440	.2	1.7303	.6	1.8262
.5	1.5676	.9	1.6459	.3	1.7324	.7	1.8285
.6	1.5693	57.0	1.6477	.4	1.7344	.8	1.8308
.7	1.5710	.1	1.6496	.5	1.7365	.9	1.8331
.8	1.5727	.2	1.6515	.6	1.7386	66.0	1.8354
.9	1.5744	.3	1.6534	.7	1.7407	.1	1.8378
53.0	1.5761	.4	1.6553	.8	1.7428	.2	1.8401
.1	1.5778	.5	1.6571	.9	1.7449	.3	1.8424
.2	1.5795	.6	1.6590	62.0	1.7470	.4	1.8448
.3	1.5812	.7	1.6609	.1	1.7491	.4	1.8448
.4	1.5830	.8	1.6628	.2	1.7512	.5	1.8471
.5	1.5847	.9	1.6648	.3	1.7533	.6	1.8495
.6	1.5864	58.0	1.6667	.4	1.7554	.7	1.8519
.7	1.5882	.1	1.6686	.5	1.7576	.8	1.8542
.8	1.5899	.2	1.6705	.6	1.7597	.9	1.8566
.9	1.5917	.3	1.6724	.7	1.7618	67.0	1.8590
54.0	1.5934	.4	1.6744	.8	1.7640	.1	1.8614
.1	1.5952	.5	1.6763	.9	1.7661	.2	1.8638
.2	1.5969	.6	1.6782	63.0	1.7683	.3	1.8662
.3	1.5987	.7	1.6802	.1	1.7705	.4	1.8686

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
.5	1.8710	.2	1.8880	.9	1.9054	.6	1.9231
.6	1.8734	.3	1.8905	69.0	1.9079	.7	1.9256
.7	1.8758	.4	1.8930	.1	1.9104	.8	1.9282
.8	1.8782	.5	1.8954	.2	1.9129	.9	1.9308
.9	1.8807	.6	1.8979	.3	1.9155	70.0	1.9333
68.0	1.8831	.7	1.9004	.4	1.9180		
.1	1.8856	.8	1.9029	.5	1.9205		

XXXIV (b).—EQUIVALENT BAUMÉ DEGREES (AMERICAN STANDARD) WITH SPECIFIC GRAVITY AT 60° F.

Sp. Gr. $=\frac{140}{130+B°}$ **For Liquids Lighter than Water.**

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
10.0	1.0000	.2	0.9845	.4	0.9695	.6	0.9550
.1	0.9993	.3	0.9838	.5	0.9689	.7	0.9543
.2	0.9986	.4	0.9831	.6	0.9682	.8	0.9537
.3	0.9979	.5	0.9825	.7	0.9675	.9	0.9530
.4	0.9972	.6	0.9818	.8	0.9669	17.0	0.9524
.5	0.9964	.7	0.9811	.9	0.9662	.1	0.9517
.6	0.9957	.8	0.9804	15.0	0.9655	.2	0.9511
.7	0.9950	.9	0.9797	.1	0.9649	.3	0.9504
.8	0.9943	13.0	0.9790	.2	0.9642	.4	0.9498
.9	0.9936	.1	0.9783	.3	0.9635	.5	0.9492
11.0	0.9929	.2	0.9777	.4	0.9629	.6	0.9485
.1	0.9922	.3	0.9770	.5	0.9622	.7	0.9479
.2	0.9915	.4	0.9763	.6	0.9615	.8	0.9472
.3	0.9908	.5	0.9756	.7	0.9609	.9	0.9466
.4	0.9901	.6	0.9749	.8	0.9602	18.0	0.9459
.5	0.9894	.7	0.9743	.9	0.9596	.1	0.9453
.6	0.9887	.8	0.9736	16.0	0.9589	.2	0.9447
.7	0.9880	.9	0.9729	.1	0.9582	.3	0.9440
.8	0.9873	14.0	0.9722	.2	0.9576	.4	0.9434
.9	0.9866	.1	0.9715	.3	0.9569	.5	0.9428
12.0	0.9859	.2	0.9709	.4	0.9563	.6	0.9421
.1	0.9852	.3	0.9702	.5	0.9556	.7	0.9415

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
.8	0.9409	.2	0.9138	.6	0.8883	32.0	0.8642
.9	0.9402	.3	0.9132	.7	0.8878	.1	0.8637
19.0	0.9396	.4	0.9126	.8	0.8872	.2	0.8631
.1	0.9390	.5	0.9121	.9	0.8866	.3	0.8626
.2	0.9383	.6	0.9115	28.0	0.8861	.4	0.8621
.3	0.9377	.7	0.9109	.1	0.8855	.5	0.8615
.4	0.9371	.8	0.9103	.2	0.8850	.6	0.8610
.5	0.9365	.9	0.9097	.3	0.8844	.7	0.8605
.6	0.9358	24.0	0.9091	.4	0.8838	.8	0.8600
.7	0.9352	.1	0.9085	.5	0.8833	.9	0.8594
.8	0.9346	.2	0.9079	.6	0.8827	33.0	0.8589
.9	0.9340	.3	0.9073	.7	0.8822	.1	0.8584
20.0	0.9333	.4	0.9067	.8	0.8816	.2	0.8578
.1	0.9327	.5	0.9061	.9	0.8811	.3	0.8573
.2	0.9321	.6	0.9056	29.0	0.8805	.4	0.8568
.3	0.9315	.7	0.9050	.1	0.8799	.5	0.8563
.4	0.9309	.8	0.9044	.2	0.8794	.6	0.8557
.5	0.9302	.9	0.9038	.3	0.8788	.7	0.8552
.6	0.9296	25.0	0.9032	.4	0.8783	.8	0.8547
.7	0.9290	.1	0.9026	.5	0.8777	.9	0.8542
.8	0.9284	.2	0.9021	.6	0.8772	34.0	0.8537
.9	0.9278	.3	0.9015	.7	0.8766	.1	0.8531
21.0	0.9272	.4	0.9009	.8	0.8761	.2	0.8526
.1	0.9265	.5	0.9003	.9	0.8755	.3	0.8521
.2	0.9259	.6	0.8997	30.0	0.8750	.4	0.8516
.3	0.9253	.7	0.8992	.1	0.8745	.5	0.8511
.4	0.9247	.8	0.8986	.2	0.8739	.6	0.8505
.5	0.9241	.9	0.8980	.3	0.8734	.7	0.8500
.6	0.9235	26.0	0.8974	.4	0.8728	.8	0.8495
.7	0.9229	.1	0.8969	.5	0.8723	.9	0.8490
.8	0.9223	.2	0.8963	.6	0.8717	35.0	0.8485
.9	0.9217	.3	0.8957	.7	0.8712	.1	0.8480
22.0	0.9211	.4	0.8951	.8	0.8706	.2	0.8475
.1	0.9204	.5	0.8946	.9	0.8701	.3	0.8469
.2	0.9198	.6	0.8940	31.0	0.8696	.4	0.8464
.3	0.9192	.7	0.8934	.1	0.8690	.5	0.8459
.4	0.9186	.8	0.8929	.2	0.8685	.6	0.8454
.5	0.9180	.9	0.8923	.3	0.8679	.7	0.8449
.6	0.9174	27.0	0.8917	.4	0.8674	.8	0.8444
.7	0.9168	.1	0.8912	.5	0.8669	.9	0.8439
.8	0.9162	.2	0.8906	.6	0.8663	36.0	0.8434
.9	0.9156	.3	0.8900	.7	0.8658	.1	0.8429
23.0	0.9150	.4	0.8895	.8	0.8653	.2	0.8424
.1	0.9144	.5	0.8889	.9	0.8647	.3	0.8419

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
.4	0.8413	.8	0.8197	.2	0.7991	.6	0.7795
.5	0.8408	.9	0.8192	.3	0.7986	.7	0.7791
.6	0.8403	41.0	0.8187	.4	0.7982	.8	0.7786
.7	0.8398	.1	0.8182	.5	0.7977	.9	0.7782
.8	0.8393	.2	0.8178	.6	0.7973	50.0	0.7778
.9	0.8388	.3	0.8173	.7	0.7968	.1	0.7773
37.0	0.8383	.4	0.8168	.8	0.7964	.2	0.7769
.1	0.8378	.5	0.8163	.9	0.7959	.3	0.7765
.2	0.8373	.6	0.8159	46.0	0.7955	.4	0.7761
.3	0.8368	.7	0.8154	.1	0.7950	.5	0.7756
.4	0.8363	.8	0.8149	.2	0.7946	.6	0.7752
.5	0.8358	.9	0.8144	.3	0.7941	.7	0.7748
.6	0.8353	42.0	0.8140	.4	0.7937	.8	0.7743
.7	0.8348	.1	0.8135	.5	0.7932	.9	0.7739
.8	0.8343	.2	0.8130	.6	0.7928	51.0	0.7735
.9	0.8338	.3	0.8125	.7	0.7923	.1	0.7731
38.0	0.8333	.4	0.8121	.8	0.7919	.2	0.7726
.1	0.8328	.5	0.8116	.9	0.7914	.3	0.7722
.2	0.8323	.6	0.8111	47.0	0.7910	.4	0.5718
.3	0.8318	.7	0.8107	.1	0.7905	.5	0.7713
.4	0.8314	.8	0.8102	.2	0.7901	.6	0.7709
.5	0.8309	.9	0.8097	.3	0.7896	.7	0.7705
.6	0.8304	43.0	0.8092	.4	0.7892	.8	0.7701
.7	0.8299	.1	0.8088	.5	0.7887	.9	0.7697
.8	0.8294	.2	0.8083	.6	0.7883	52.0	0.7692
.9	0.8289	.3	0.8078	.7	0.7878	.1	0.7688
39.0	0.8284	.4	0.8074	.8	0.7874	.2	0.7684
.1	0.8279	.5	0.8069	.9	0.7870	.3	0.7680
.2	0.8274	.6	0.8065	48.0	0.7865	.4	0.7675
.3	0.8269	.7	0.8060	.1	0.7861	.5	0.7671
.4	0.8264	.8	0.8055	.2	0.7856	.6	0.7667
.5	0.8260	.9	0.8051	.3	0.7852	.7	0.7663
.6	0.8255	44.0	0.8046	.4	0.7848	.8	0.7659
.7	0.8250	.1	0.8041	.5	0.7843	.9	0.7654
.8	0.8245	.2	0.8037	.6	0.7839	53.0	0.7650
.9	0.8240	.3	0.8032	.7	0.7834	.1	0.7646
40.0	0.8235	.4	0.8028	.8	0.7830	.2	0.7642
.1	0.8230	.5	0.8023	.9	0.7826	.3	0.7638
.2	0.8226	.6	0.8018	49.0	0.7821	.4	0.7634
.3	0.8221	.7	0.8014	.1	0.7817	.5	0.7629
.4	0.8216	.8	0.8009	.2	0.7812	.6	0.7625
.5	0.8211	.9	0.8005	.3	0.7808	.7	0.7621
.6	0.8206	45.0	0.8000	.4	0.7804	.8	0.7617
.7	0.8202	.1	0.7995	.5	0.7799	.9	0.7613

Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
54.0	0.7609	.4	0.7431	.8	0.7261	.2	0.7099
.1	0.7605	.5	0.7427	.9	0.7258	.3	0.7096
.2	0.7600	.6	0.7423	63.0	0.7254	.4	0.7092
.3	0.7596	.7	0.7419	.1	0.7250	.5	0.7089
.4	0.7592	.8	0.7415	.2	0.7246	.6	0.7085
.5	0.7588	.9	0.7411	.3	0 7243	.7	0.7081
.6	0.7584	59.0	0.7407	.4	0.7239	.8	0.7078
.7	0.7580	.1	0.7403	.5	0.7235	.9	0.7074
.8	0.7576	.2	0.7400	.6	0.7231	68.0	0.7071
.9	0.7572	.3	0.7396	.7	0.7228	.1	0.7067
55.0	0.7568	.4	0.7392	.8	0.7224	.2	0.7064
.1	0.7563	.5	0.7388	.9	0.7220	.3	0.7060
.2	0.7559	.8	0.7384	64.0	0.7216	.4	0.7056
.3	0.7555	.7	0.7380	.1	0.7213	.5	0.7053
.4	0.7551	.8	0.7376	.2	0.7209	.6	0.7049
.5	0.7547	.9	0.7372	.3	0.7205	.7	0.7046
.6	0.7543	60.0	0.7368	.4	0.7202	.8	0.7042
.7	0.7539	.1	0.7365	.5	0.7198	.9	0.7039
.8	0.7535	.2	0.7361	.6	0.7194	69.0	0.7035
.9	0.7531	.3	0.7357	.7	0.7191	.1	0.7032
56.0	0.7527	.4	0.7353	.8	0.7187	.2	0.7028
.1	0.7523	.5	0.7349	.9	0.7183	.3	0.7025
.2	0.7519	.6	0.7345	65.0	0.7179	.4	0.7021
.3	0.7515	.7	0.7341	.1	0.7176	.5	0.7018
.4	0.7511	.8	0.7338	.2	0.7172	.6	0.7014
.5	0.7507	.9	0.7334	.3	0.7168	.7	0.7011
.6	0.7503	61.0	0.7330	.4	0.7165	.8	0.7007
.7	0.75	.1	0.7326	.5	0.7161	.9	0.7004
.8	0.7495	.2	0.7322	.6	0.7157	70.0	0.7000
.9	0.7491	.3	0.7318	.7	0.7154	.1	0.6997
57.0	0.7487	.4	0.7315	.8	0.7150	.2	0.6993
.1	0.7483	.5	0.7311	.9	0.7147	.3	0.6990
.2	0.7479	.6	0.7307	66.0	0.7143	.4	0.6986
.3	0.7475	.7	0.7303	.1	0.7139	.5	0.6983
.4	0.7471	.8	0.7299	.2	0.7136	.6	0.6979
.5	0.7467	.9	0.7295	.3	0.7132	.7	0.6976
.6	0.7463	62.0	0.7292	.4	0.7128	.8	0.6972
.7	0.7459	.1	0.7288	.5	0.7125	.9	0.6969
.8	0.7455	.2	0.7284	.6	0.7121	71.0	0.6965
.9	0.7451	.3	0.7280	.7	0.7117	.1	0.6962
58.0	0.7447	.4	0.7277	.8	0.7114	.2	0.6958
.1	0.7443	.5	0.7273	.9	0.7110	.3	0.6955
.2	0.7439	.6	0.7269	67.0	0.7107	.4	0.6951
.3	0.7435	.7	0.7265	.1	0.7103	.5	0.6948

Degrees Baumé.	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity	Degrees Baumé	Specific Gravity
.6	0.6944	.8	0.6869	.9	0.6799	78.0	0.6731
.7	0.6941	.9	0.6866	76.0	0.6796	.1	0.6728
.8	0.6938	74.0	0.6863	.1	0.6793	.2	0.6724
.9	0.6934	.1	0.6859	.2	0.6790	.3	0.6721
72.0	0.6931	.2	0.6856	.3	0.6786	.4	0.6718
.1	0.6927	.3	0.6853	.4	0.6783	.5	0.6715
.2	0.6924	.4	0.6849	.5	0.6780	.6	0.6711
.3	0.6920	.5	0.6846	.6	0.6776	.7	0.6708
.4	0.6917	.6	0.6843	.7	0.6773	.8	0.6705
.5	0.6914	.7	0.6839	.8	0.6770	.9	0.6702
.6	0.6910	.8	0.6836	.9	0.6767	79.0	0.6699
.7	0.6907	.9	0.6833	77.0	0.6763	.1	0.6695
.8	0.6903	75.0	0.6829	.1	0.6760	.2	0.6692
.9	0.6900	.1	0.6826	.2	0.6757	.3	0.6689
73.0	0.6897	.2	0.6823	.3	0.6753	.4	0.6686
.1	0.6893	.3	0.6819	.4	0.6750	.5	0.6683
.2	0.6890	.4	0.6816	.5	0.6747	.6	0.6679
.3	0.6886	.5	0.6813	.6	0.6744	.7	0.6676
.4	0.6883	.6	0.6809	.7	0.6740	.8	0.6673
.5	0.6880	.7	0.6806	.8	0.6737	.9	0.6670
.6	0.6876	.8	0.6803	.9	0.6734	80.0	0.6667
.7	0.6873						

By W. C. Ferguson

Degrees Baumé.	Specific Gravity $\frac{60°}{60°}$ F.	Degrees Twaddell.	Per Cent H_2SO_4.	Weight of 1 Cu. Ft. in Lbs. Av.	Per Cent O. V.*	Pounds O. V. in 1 Cubic Foot.
0	1.0000	0.0	0.00	62.37	0.00	0.00
1	1.0069	1.4	1.02	62.80	1.09	0.68
2	1.0140	2.8	2.08	63.24	2.23	1.41
3	1.0211	4.2	3.13	63.69	3.36	2.14
4	1.0284	5.7	4.21	64.14	4.52	2.90
5	1.0357	7.1	5.28	64.60	5.67	3.66
6	1.0432	8.6	6.37	65.06	6.84	4.45
7	1.0507	10.1	7.45	65.53	7.99	5.24
8	1.0584	11.7	8.55	66.01	9.17	6.06
9	1.0662	13.2	9.66	66.50	10.37	6.89
10	1.0741	14.8	10.77	66.99	11.56	7.74
11	1.0821	16.4	11.89	67.49	12.76	8.61
12	1.0902	18.0	13.01	68.00	13.96	9.49
13	1.0985	19.7	14.13	68.51	15.16	10.39
14	1.1069	21.4	15.25	69.04	16.36	11.30
15	1.1154	23.1	16.38	69.57	17.58	12.23
16	1.1240	24.8	17.53	70.10	18.81	13.19
17	1.1328	26.6	18.71	70.65	20.08	14.18
18	1.1417	28.3	19.89	71.21	21.34	15.20
19	1.1508	30.2	21.07	71.78	22.61	16.23
20	1.1600	32.0	22.25	72.35	23.87	17.27
21	1.1694	33.9	23.43	72.94	25.14	18.34
22	1.1789	35.8	24.61	73.53	26.41	19.42
23	1.1885	37.7	25.81	74.13	27.69	20.53
24	1.1983	39.7	27.03	74.74	29.00	21.68

Sp. Gr. determinations were made at 60° F., compared with water at 60° F.

From the Sp. Grs., the corresponding degrees Baumé were calculated by the following formula: Baumé = 145 − 145/Sp. Gr.

Baumé Hydrometers for use with this table must be graduated by the above formula, which formula should always be printed on the scale.

* 66° Baumé = Sp. Gr. 1.8354 = Oil of Vitriol (O. V.).
1 cu. ft. water at 60° F. weighs 62.37 lbs. av.
Atomic weights from F. W. Clarke's table of 1901. O = 16.
H_2SO_4 = 100 per cent.

	% H_2SO_4	% O. V.	%60°
O. V.	= 93.19 =	100.00 =	119.98
60°	= 77.67 =	83.35 =	100.00
50°	= 62.18 =	66.72 =	80.06

AND H. P. TALBOT

Degrees Baumé.	* Freezing (Melting) Point. F.
0	32.0
1	31.2
2	30.5
3	29.8
4	28.9
5	28.1
6	27.2
7	26.3
8	25.1
9	24.0
10	22.8
11	21.5
12	20.0
13	18.3
14	16.6
15	14.7
16	12.6
17	10.2
18	7.7
19	4.8
20	+ 1.6
21	− 1.8
22	− 6.0
23	−11
24	−16

APPROXIMATE BOILING POINTS

50° B,	295° F.
60° "	386° "
61° "	400° "
62° "	415° "
63° "	432° "
64° "	451° "
65° "	485° "
66° "	538° "

FIXED POINTS

Specific Gravity.	Per Cent H_2SO_4.	Specific Gravity.	Per Cent H_2SO_4.
1.0000	.00	1.5281	62.34
1.0048	.71	1.5440	63.79
1.0347	5.14	1.5748	66.51
1.0649	9.48	1.6272	71.00
1.0992	14.22	1.6679	74.46
1.1353	19.04	1.7044	77.54
1.1736	23.94	1.7258	79.40
1.2105	28.55	1.7472	81.32
1.2513	33.49	1.7700	83.47
1.2951	38.64	1.7959	86.36
1.3441	44.15	1.8117	88.53
1.3947	49.52	1.8194	89.75
1.4307	53.17	1.8275	91.32
1.4667	56.68	1.8354	93.19
1.4822	58.14		

Acids stronger than 66° Bé. should have their percentage compositions determined by chemical analysis.

* Calculated from Pickering's results, Jour. of Lon. Ch. Soc., vol. 57, p. 363.

AUTHORITIES — W. C. FERGUSON; H. P. TALBOT.

This table has been approved and adopted as a standard by the Manufacturing Chemists' Association of the United States.

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HENRY HOWARD,
JAS. L. MORGAN,
ARTHUR WYMAN,
A. G. ROSENGARTEN,
Executive Committee.

New York, June 23, 1904.

Degrees Baumé.	Specific Gravity $\frac{60°}{60°}$ F.	Degrees Twaddell.	Per Cent H_2SO_4.	Weight of 1 Cu. Ft. in Lbs. Av.	Per Cent O. V.	Pounds O. V. in 1 Cubic Foot.
25	1.2083	41.7	28.28	75.36	30.34	22.87
26	1.2185	43.7	29.53	76.00	31.69	24.08
27	1.2288	45.8	30.79	76.64	33.04	25.32
28	1.2393	47.9	32.05	77.30	34.39	26.58
29	1.2500	50.0	33.33	77.96	35.76	27.88
30	1.2609	52.2	34.63	78.64	37.16	29.22
31	1.2719	54.4	35.93	79.33	38.55	30.58
32	1.2832	56.6	37.26	80.03	39.98	32.00
33	1.2946	58.9	38.58	80.74	41.40	33.42
34	1.3063	61.3	39.92	81.47	42.83	34.90
35	1.3182	63.6	41.27	82.22	44.28	36.41
36	1.3303	66.1	42.63	82.97	45.74	37.95
37	1.3426	68.5	43.99	83.74	47.20	39.53
38	1.3551	71.0	45.35	84.52	48.66	41.13
39	1.3679	73.6	46.72	85.32	50.13	42.77
40	1.3810	76.2	48.10	86.13	51.61	44.45
41	1.3942	78.8	49.47	86.96	53.08	46.16
42	1.4078	81.6	50.87	87.80	54.58	47.92
43	1.4216	84.3	52.26	88.67	56.07	49.72
44	1.4356	87.1	53.66	89.54	57.58	51.56
45	1.4500	90.0	55.07	90.44	59.09	53.44
46	1.4646	92.9	56.48	91.35	60.60	55.36
47	1.4796	95.9	57.90	92.28	62.13	57.33
48	1.4948	99.0	59.32	93.23	63.65	59.34
49	1.5104	102.1	60.75	94.20	65.18	61.40
50	1.5263	105.3	62.18	95.20	66.72	63.52
51	1.5426	108.5	63.66	96.21	68.31	65.72
52	1.5591	111.8	65.13	97.24	69.89	67.96
53	1.5761	115.2	66.63	98.30	71.50	70.28
54	1.5934	118.7	68.13	99.38	73.11	72.66
55	1.6111	122.2	69.65	100.48	74.74	75.10
56	1.6292	125.8	71.17	101.61	76.37	77.60
57	1.6477	129.5	72.75	102.77	78.07	80.23
58	1.6667	133.3	74.36	103.95	79.79	82.95
59	1.6860	137.2	75.99	105.16	81.54	85.75

ALLOWANCE FOR TEMPERATURE

At	10°	Bé. .029°	Bé. or	.00023	Sp. Gr.	= 1° F.
"	20°	" .036°	"	.00034	"	= 1° "
"	30°	" .035°	"	.00039	"	= 1° "
"	40°	" .031°	"	.00041	"	= 1° "
"	50°	" .028°	"	.00045	"	= 1° "
"	60°	" .026°	"	.00053	"	= 1° "
"	63°	" .026°	"	.00057	"	= 1° "
"	66°	" .0235°	"	.00054	"	= 1° "

Degrees Baumé.	* Freezing (Melting) Point. °F.	Per Cent 60° Baumé.	Pounds 60° Baumé in 1 Cubic Foot.	Per Cent 50° Baumé.	Pounds 50° Baumé in 1 Cubic Foot.
25	−23				
26	−30				
27	−39				
28	−49				
29	−61				
30	−74				
31	−82				
32	−96				
33	−97				
34	−91				
35	−81				
36	−70				
37	−60				
38	−53				
39	−47				
40	−41	61.93	53.34	77.36	66.63
41	−35	63.69	55.39	79.56	69.19
42	−31	65.50	57.50	81.81	71.83
43	−27	67.28	59.66	84.05	74.53
44	−23	69.09	61.86	86.30	77.27
45	−20	70.90	64.12	88.56	80.10
46	−14	72.72	66.43	90.83	82.98
47	−15	74.55	68.79	93.12	85.93
48	−18	76.37	71.20	95.40	88.94
49	−22	78.22	73.68	97.70	92.03
50	−27	80.06	76.21	100.00	95.20
51	−33	81.96	78.85	102.38	98.50
52	−39	83.86	81.54	104.74	101.85
53	−49	85.79	84.33	107.15	105.33
54	−59	87.72	87.17	109.57	108.89
55	.. Below 40	89.67	90.10	112.01	112.55
56	..	91.63	93.11	114.46	116.30
57	..	93.67	96.26	117.00	120.24
58	..	95.74	99.52	119.59	124.31
59	− 7	97.84	102.89	122.21	128.52

Degrees Baumé.	Specific Gravity $\frac{60°}{60°}$ F.	Degrees Twaddell.	Per Cent H_2SO_4.	Weight of 1 Cu. Ft. in Lbs. Av.	Per Cent O. V.	Pounds O. V. in 1 Cubic Foot.
60	1.7059	141.2	77.67	106.40	83.35	88.68
61	1.7262	145.2	79.43	107.66	85.23	91.76
62	1.7470	149.4	81.30	108.96	87.24	95.06
63	1.7683	153.7	83.34	110.29	89.43	98.63
64	1.7901	158.0	85.66	111.65	91.92	102.63
64¼	1.7957	159.1	86.33	112.00	92.64	103.75
64½	1.8012	160.2	87.04	112.34	93.40	104.93
64¾	1.8068	161.4	87.81	112.69	94.23	106.19
65	1.8125	162.5	88.65	113.05	95.13	107.54
65¼	1.8182	163.6	89.55	113.40	96.10	108.97
65½	1.8239	164.8	90.60	113.76	97.22	110.60
65¾	1.8297	165.9	91.80	114.12	98.51	112.42
66	1.8354	167.1	93.19	114.47	100.00	114.47

XXXVI. — FUMING SULPHURIC ACID AT 20°

Cl. Winkler

Specific Gravity.	Total SO_3.	100 Parts Contain			Specific Gravity.	Total SO_3.	100 Parts Contain		
		Free SO_3*.	H_2SO_4	Acid of 66° B.			Free SO_3.*	H_2SO_4	Acid of 66° B.
1.835	75.31		92.25	99	1.905	83.57	10.56	89.44	65.68
1.840	77.38		94.79	90.69	1.910	83.73	11.43	88.57	65.25
1.845	79.28		97.11	83.08	1.915	84.08	13.33	86.67	63.84
1.850	80.01		98.01	80.10	1.920	84.56	15.95	84.05	62.10
1.855	80.95		99.16	76.38	1.925	85.06	18.67	81.33	59.90
1.860	81.84	1.54	98.46	72.81	1.930	85.57	21.34	78.66	57.86
1.865	82.12	2.66	97.34	71.71	1.935	86.23	25.65	74.35	55.21
1.870	82.41	4.28	95.76	70.53	1.940	86.78	28.03	71.97	53.00
1.875	82.63	5.44	94.56	69.35	1.945	87.13	29.94	70.06	51.60
1.880	82.81	6.42	93.58	68.92	1.950	87.41	31.46	63.54	50.48
1.885	82.97	7.29	92.71	68.27	1.955	87.65	32.77	67.23	49.52
1.890	83.13	8.16	91.94	67.55	1.960	88.22	35.87	64.13	47.23
1.895	83.43	9.34	90.66	66.81	1.965	88.92	39.68	60.32	44.42
1.900	83.48	10.07	89.93	66.24	1.970	89.83	44.64	55.36	40.78

* This column gives the amount of SO_3 which may be distilled off.

Degrees Baumé.	* Freezing (Melting) Point.	Per Cent 60° Baumé.	Pounds 60° Baumé in Cubic Foot.	Per Cent 50° Baumé.	Pounds 50° Baumé in Cubic Foot.
60	+12.6	100.00	106.40	124.91	132.91
61	27.3	102.27	110.10	127.74	137.52
62	39.1	104.67	114.05	130.75	142.47
63	46.1	107.30	118.34	134.03	147.82
64	46.4	110.29	123.14	137.76	153.81
64¼	43.6	111.15	124.49	138.84	155.50
64½	41.1	112.06	125.89	139.98	157.25
64¾	37.9	113.05	127.40	141.22	159.14
65	33.1	114.14	129.03	142.57	161.17
65¼	24.6	115.30	130.75	144.02	163.32
65½	13.4	116.65	132.70	145.71	165.76
65¾	− 1	118.19	134.88	147.63	168.48
66	−29	119.98	137.34	149.87	171.56

XXXVII. — SULPHURIC ACID

94–100% H_2SO_4

BY H. B. BISHOP

The acid used in this table was prepared from Baker and Adamson's c.p. sulphuric acid 95 per cent, which was strengthened to 100 per cent by the addition of fuming sulphuric acid made by distilling fuming acid (70 per cent free SO_3) into a portion of the 95 per cent c.p. acid. The final acid was tested for impurities: residue upon evaporation, chlorine, niter and sulphur dioxide. The only impurity found was a trace of sulphur dioxide (0.001 per cent) which was less than the sensitiveness of the determination.

The analytical and specific gravity determinations, and the allowance for temperature were made in the same manner, and with the same accuracy as in the sulphuric acid table adopted in 1904, the specific gravity 1.8354 and 93.19 per cent H_2SO_4 being taken as a standard.

The actual determinations were made within a few hundredths of a per cent of the points given in the table, the even percentages being calculated by interpolation.

Per Cent H_2SO_4.		Sp. Gr. at 60° F.	Allowance for Temperature.
66° Bé.	93.19	1.8354	At 94% 0.00054 sp. gr. = 1° F.
	94.00	1.8381	At 96% 0.00053 sp. gr. = 1° F.
	95.00	1.8407	At 97.5% 0.00052 sp. gr. = 1° F.
	96.00	1.8427	At 100% 0.00052 sp. gr. = 1° F.
	97.00	1.8437	
	97.50	1.8439	
	98.00	1.8437	
	99.00	1.8424	
	100.00	1.8391	

XXXVIII. — SULPHURIC ACID

LUNGE AND ISLER

Specific Gravity $\frac{15°}{4°}$ in vacuo	100 parts by weight correspond to		1 liter contains grams		Specific Gravity $\frac{15°}{4°}$ in vacuo	100 parts by weight correspond to		1 liter contains grams	
	% SO_3	% H_2SO_4	SO_3	H_2SO_4		% SO_3	% H_2SO_4	SO_3	H_2SO_4
1.000	0.07	0.09	1	1	1.190	21.26	26.04	253	310
1.005	0.68	0.83	7	8	1.195	21.78	26.68	260	319
1.010	1.28	1.57	13	16	1.200	22.30	27.32	268	328
1.015	1.88	2.30	19	23	1.205	22.82	27.95	275	337
1.020	2.47	3.03	25	31	1.210	23.33	28.58	282	346
1.025	3.07	3.76	32	39	1.215	23.84	29.21	290	355
1.030	3.67	4.49	38	46	1.220	24.36	29.84	297	364
1.035	4.27	5.23	44	54	1.225	24.88	30.48	305	373
1.040	4.87	5.96	51	62	1.230	25.39	31.11	312	382
1.045	5.45	6.67	57	71	1.235	25.88	31.70	320	391
1.050	6.02	7.37	63	77	1.240	26.35	32.28	327	400
1.055	6.59	8.07	70	85	1.245	26.83	32.86	334	409
1.060	7.16	8.77	76	93	1.250	27.29	33.43	341	418
1.065	7.73	9.47	82	102	1.255	27.76	34.00	348	426
1.070	8.32	10.19	89	109	1.260	28.22	34.57	356	435
1.075	8.90	10.90	96	117	1.265	28.69	35.14	363	444
1.080	9.47	11.60	103	125	1.270	29.15	35.71	370	454
1.085	10.04	12.30	109	133	1.275	29.62	36.29	377	462
1.090	10.60	12.99	116	142	1.280	30.10	36.87	385	472
1.095	11.16	13.67	122	150	1.285	30.57	37.45	393	481
1.100	11.71	14.35	129	158	1.290	31.04	38.03	400	490
1.105	12.27	15.03	136	166	1.295	31.52	38.61	408	500
1.110	12.82	15.71	143	175	1.300	31.99	39.19	416	510
1.115	13.36	16.36	149	183	1.305	32.46	39.77	424	519
1.120	13.89	17.01	156	191	1.310	32.94	40.35	432	529
1.125	14.42	17.66	162	199	1.315	33.41	40.93	439	538
1.130	14.95	18.31	169	207	1.320	33.88	41.50	447	548
1.135	15.48	18.96	176	215	1.325	34.35	42.08	455	557
1.140	16.01	19.61	183	223	1.330	34.80	42.66	462	567
1.145	16.54	20.26	189	231	1.335	35.27	43.20	471	577
1.150	17.07	20.91	196	239	1.340	35.71	43.74	479	586
1.155	17.59	21.55	203	248	1.345	36.14	44.28	486	596
1.160	18.11	22.19	210	257	1.350	36.58	44.82	494	605
1.165	18.64	22.83	217	266	1.355	37.02	45.35	502	614
1.170	19.16	23.47	224	275	1.360	37.45	45.88	509	624
1.175	19.69	24.12	231	283	1.365	37.89	46.41	517	633
1.180	20.21	24.76	238	292	1.370	38.32	46.94	525	643
1.185	20.73	25.40	246	301	1.375	38.75	47.47	533	653

Specific Gravity $\frac{15^\circ}{4^\circ}$ in vacuo	100 parts by weight correspond to		1 liter contains grams		Specific Gravity $\frac{15^\circ}{4^\circ}$ in vacuo	100 parts by weight correspond to		1 liter contains grams	
	% SO_3	% H_2SO_4	SO_3	H_2SO_4		% SO_3	% H_2SO_4	SO_3	H_2SO_4
1.380	39.18	48.00	541	662	1.590	55.18	67.59	877	1075
1.385	39.62	48.53	549	672	1.595	55.55	68.05	886	1085
1.390	40.05	49.06	557	682	1.600	55.93	68.51	89	1096
1.395	40.48	49.59	564	692	1.605	56.30	68.97	904	1107
1.400	40.91	50.11	573	702	1.610	56.68	69.43	913	1118
1.405	41.33	50.63	581	711	1.615	57.05	69.89	921	1128
1.410	41.76	51.15	589	721	1.620	57.40	70.32	930	1139
1.415	42.17	51.66	597	730	1.625	57.75	70.74	938	1150
1.420	42.57	52.15	604	740	1.630	58.09	71.16	947	1160
1.425	42.96	52.63	612	750	1.635	58.43	71.57	955	1170
1.430	43.36	53.11	620	759	1.640	58.77	71.99	964	1181
1.435	43.75	53.59	628	769	1.645	59.10	72.40	972	1192
1.440	44.14	54.07	636	779	1.650	59.45	72.82	981	1202
1.445	44.53	54.55	643	789	1.655	59.78	73.23	989	1212
1.450	44.92	55.03	651	798	1.660	60.11	73.64	998	1222
1.455	45.31	55.50	659	808	1.665	60.46	74.07	1007	1233
1.460	45.69	55.97	667	817	1.670	60.82	74.51	1016	1244
1.465	46.07	56.43	675	827	1.675	61.20	74.97	1025	1256
1.470	46.45	56.90	683	837	1.680	61.57	75.42	1034	1267
1.475	46.83	57.37	691	846	1.685	61.93	75.86	1043	1278
1.480	47.21	57.83	699	856	1.690	62.29	76.30	1053	1289
1.485	47.57	58.28	707	865	1.695	62.64	76.73	1062	1301
1.490	47.95	58.74	715	876	1.700	63.00	77.17	1071	1312
1.495	48.34	59.22	723	885	1.705	63.35	77.60	1080	1323
1.500	48.73	59.70	731	896	1.710	63.70	78.04	1089	1334
1.505	49.12	60.18	739	906	1.715	64.07	78.48	1099	1346
1.510	49.51	60.65	748	916	1.720	64.43	78.92	1108	1357
1.515	49.89	61.12	756	926	1.725	64.78	79.36	1118	1369
1.520	50.28	61.59	764	936	1.730	65.14	79.80	1127	1381
1.525	50.66	62.06	773	946	1.735	65.50	80.24	1136	1392
1.530	51.04	62.53	781	957	1.740	65.86	80.68	1146	1404
1.535	51.43	63.00	789	967	1.745	66.22	81.12	1156	1416
1.540	51.78	63.43	797	977	1.750	66.58	81.56	1165	1427
1.545	52.12	63.85	805	987	1.755	66.94	82.00	1175	1439
1.550	52.46	64.26	813	996	1.760	67.30	82.44	1185	1451
1.555	52.79	64.67	821	1006	1.765	67.65	82.88	1194	1463
1.560	53.12	65.08	829	1015	1.770	68.02	83.32	1204	1475
1.565	53.46	65.49	837	1025	1.775	68.49	83.90	1216	1489
1.570	53.80	65.90	845	1035	1.780	68.98	84.50	1228	1504
1.575	54.13	66.30	853	1044	1.785	69.47	85.10	1240	1519
1.580	54.46	66.71	861	1054	1.790	69.96	85.70	1252	1534
1.585	54.80	67.13	869	1064	1.795	70.46	86.30	1265	1549

Specific Gravity $\frac{15^\circ}{4^\circ}$ in vacuo	100 parts by weight correspond to		1 liter contains grams		Specific Gravity $\frac{15^\circ}{4^\circ}$ in vacuo	100 parts by weight correspond to		1 liter contains grams	
	% SO_3	% H_2SO_4	SO_3	H_2SO_4		% SO_3	% H_2SO_4	SO_3	H_2SO_4
1.800	70.94	86.90	1277	1564	1.833	75.72	92.75	1388	1700
1.805	71.50	87.60	1291	1581	1.834	75.96	93.05	1393	1706
1.810	72.08	88.30	1305	1598	1.835	76.27	93.43	1400	1713
1.815	72.69	89.05	1319	1621	1.836	76.57	93.80	1405	1722
1.820	73.51	90.05	1338	1639	1.837	76.90	94.20	1412	1730
1.821	73.63	90.20	1341	1643	1.838	77.23	94.60	1419	1739
1.822	73.80	90.40	1345	1647	1.839	77.55	95.00	1426	1748
1.823	73.96	90.60	1348	1651	1.840	78.04	95.60	1436	1759
1.824	74.12	09.80	1352	1656	1.8405	78.33	95.95	1441	1765
1.825	74.29	91.00	1356	1661	1.8410	79.19	97.00	1458	1786
1.826	74.49	91.25	1360	1666	1.8415	79.76	97.70	1469	1799
1.827	74.69	91.50	1364	1671	1.8410	80.16	98.20	1476	1808
1.828	74.86	91.70	1368	1676	1.8405	80.57	98.70	1483	1816
1.829	75.03	91.90	1372	1681	1.8400	80.98	99.20	1490	1825
1.830	75.19	92.10	1376	1685	1.8395	81.18	99.45	1494	1830
1.831	75.35	92.30	1380	1690	1.8390	81.39	99.70	1497	1834
1.832	75.53	92.52	1384	1695	1.8385	81.59	99.95	1500	1838

XXXIX. — FUMING SULPHURIC ACID

FREE SO_3, TOTAL SO_3 AND EQUIVALENT VALUES IN TERMS OF 100%, 98% AND 93.19% H_2SO_4

By H. B. Bishop

Actual composition.		Equivalents.				Actual composition.		Equivalents.			
Per Cent Free SO_3.	Per Cent H_2SO_4.	Total SO_3.	100 Per Cent H_2SO_4.	98 Per Cent H_2SO_4.	H_2SO_4 93.19 Per Cent 66° B.	Per Cent Free SO_3.	Per Cent H_2SO_4.	Total SO_3.	100 Per Cent H_2SO_4.	98 Per Cent H_2SO_4.	H_2SO_4 93.19 Per Cent 66° B.
0	100	81.63	100.00	102.04	107.31	25	75	86.22	105.62	107.78	113.34
1	99	81.82	100.23	102.27	107.55	26	74	86.41	105.85	108.01	113.59
2	98	82.00	100.45	102.50	107.79	27	73	86.59	106.07	108.24	113.83
3	97	82.18	100.67	102.73	108.03	28	72	86.78	106.30	108.47	114.07
4	96	82.37	100.90	102.96	108.28	29	71	86.96	106.53	108.70	114.31
5	95	82.55	101.13	103.19	108.52	30	70	87.14	106.75	108.93	114.55
6	94	82.73	101.35	103.42	108.76	31	69	87.33	106.98	109.16	114.79
7	93	82.92	101.58	103.65	109.00	32	68	87.51	107.20	109.39	115.03
8	92	83.10	101.80	103.88	109.24	33	67	87.69	107.42	109.62	115.28
9	91	83.29	102.03	104.11	109.48	34	66	87.88	107.65	109.85	115.52
10	90	83.47	102.25	104.34	109.72	35	65	88.06	107.87	110.08	115.76
11	89	83.65	102.47	104.57	109.96	36	64	88.24	108.10	110.31	116.00
12	88	83.84	102.70	104.80	110.21	37	63	88.43	108.33	110.54	116.24
13	87	84.02	102.92	105.03	110.45	38	62	88.61	108.55	110.76	116.48
14	86	84.20	103.15	105.26	110.69	39	61	88.80	108.78	110.99	116.73
15	85	84.39	103.38	105.49	110.93	40	60	88.98	109.00	111.22	116.97
16	84	84.57	103.60	105.71	111.17	41	59	89.16	109.22	111.45	117.21
17	83	84.75	103.82	105.94	111.41	42	58	89.35	109.45	111.68	117.45
18	82	84.94	104.05	106.17	111.65	43	57	89.53	109.67	111.91	117.69
19	81	85.12	104.27	106.40	111.90	44	56	89.71	109.90	112.14	117.93
20	80	85.31	104.50	106.63	112.14	45	55	89.90	110.13	112.37	118.17
21	79	85.49	104.73	106.86	112.38	46	54	90.08	110.35	112.60	118.41
22	78	85.67	104.95	107.09	112.62	47	53	90.27	110.58	112.83	118.66
23	77	85.86	105.18	107.32	112.86	48	52	90.45	110.80	113.06	118.90
24	76	86.04	105.40	107.55	113.10	49	51	90.63	111.02	113.29	119.14

Actual composition.		Equivalents.				Actual composition.		Equivalents.			
Per Cent Free SO_3.	Per Cent H_2SO_4.	Total SO_3.	100 Per Cent H_2SO_4.	98 Per Cent H_2SO_4.	H_2SO_4 93.19 Per Cent 66° B.	Per Cent Free SO_3.	Per Cent H_2SO_4.	Total SO_3.	100 Per Cent H_2SO_4.	98 Per Cent H_2SO_4.	H_2SO_4 93.19 Per Cent 66° B.
50	50	90.82	111.25	113.52	119.38	75	25	95.41	116.88	119.26	125.42
51	49	91.00	111.48	113.75	119.62	76	24	95.59	117.10	119.49	125.66
52	48	91.18	111.70	113.98	119.86	77	23	95.78	117.33	119.72	125.90
53	47	91.37	111.93	114.21	120.11	78	22	95.96	117.55	119.95	126.14
54	46	91.55	112.15	114.44	120.35	79	21	96.14	117.77	120.18	126.38
55	45	91.73	112.37	114.67	120.59	80	20	96.33	118.00	120.41	126.62
56	44	91.92	112.60	114.90	120.83	81	19	96.51	118.22	120.64	126.86
57	43	92.10	112.82	115.13	121.07	82	18	96.69	118.45	120.87	127.11
58	42	92.29	113.05	115.36	121.31	83	17	96.88	118.68	121.10	127.35
59	41	92.47	113.28	115.59	121.55	84	16	97.06	118.90	121.23	127.59
60	40	92.65	113.50	115.82	121.79	85	15	97.25	119.13	121.56	127.83
61	39	92.84	113.73	116.05	122.04	86	14	97.43	119.35	121.79	128.07
62	38	93.02	113.95	116.28	122.28	87	13	97.61	119.57	122.02	128.31
63	37	93.20	114.17	116.51	122.52	88	12	97.80	119.80	122.25	128.56
64	36	93.39	114.40	116.74	122.76	89	11	97.98	120.03	122.48	128.80
65	35	93.57	114.62	116.96	123.00	90	10	98.16	120.25	122.70	129.04
66	34	93.76	114.85	117.19	123.24	91	9	98.35	120.48	122.93	129.28
67	33	93.94	115.08	117.42	123.49	92	8	98.53	120.70	123.16	129.52
68	32	94.12	115.30	117.65	123.73	93	7	98.71	120.92	123.39	129.76
69	31	94.31	115.53	117.88	123.97	94	6	98.90	121.15	123.62	130.00
70	30	94.49	115.75	118.11	124.21	95	5	99.08	121.37	123.85	130.25
71	29	94.67	115.97	118.34	124.45	96	4	99.27	121.60	124.08	130.49
72	28	94.86	116.20	118.57	124.69	97	3	99.45	121.83	124.31	130.73
73	27	95.04	116.42	118.80	124.93	98	2	99.63	122.05	124.54	130.97
74	26	95.22	116.65	119.03	125.18	99	1	99.82	122.28	124.77	131.21
						100	0	100.00	122.50	125.00	131.45

By W. C. Ferguson

Degrees Baumé.	Sp. Gr. $\frac{60°}{60°}$ F.	Degrees Twaddell.	Per Cent HNO_3.
10.00	1.0741	14.82	12.86
10.25	1.0761	15.22	13.18
10.50	1.0781	15.62	13.49
10.75	1.0801	16.02	13.81
11.00	1.0821	16.42	14.13
11.25	1.0841	16.82	14.44
11.50	1.0861	17.22	14.76
11.75	1.0881	17.62	15.07
12.00	1.0902	18.04	15.41
12.25	1.0922	18.44	15.72
12.50	1.0943	18.86	16.05
12.75	1.0964	19.28	16.39
13.00	1.0985	19.70	16.72
13.25	1.1006	20.12	17.05
13.50	1.1027	20.54	17.38
13.75	1.1048	20.96	17.71
14.00	1.1069	21.38	18.04
14.25	1.1090	21.80	18.37
14.50	1.1111	22.22	18.70
14.75	1.1132	22.64	19.02
15.00	1.1154	23.08	19.36
15.25	1.1176	23.52	19.70
15.50	1.1197	23.94	20.02
15.75	1.1219	24.38	20.36
16.00	1.1240	24.80	20.69
16.25	1.1262	25.24	21.03
16.50	1.1284	25.68	21.36
16.75	1.1306	26.12	21.70
17.00	1.1328	26.56	22.04
17.25	1.1350	27.00	22.38
17.50	1.1373	27.46	22.74
17.75	1.1395	27.90	23.08
18.00	1.1417	28.34	23.42
18.25	1.1440	28.80	23.77
18.50	1.1462	29.24	24.11
18.75	1.1485	29.70	24.47
19.00	1.1508	30.16	24.82
19.25	1.1531	30.62	25.18
19.50	1.1554	31.08	25.53
19.75	1.1577	31.54	25.88
20.00	1.1600	32.00	26.24
20.25	1.1624	32.48	26.61
20.50	1.1647	32.94	26.96
20.75	1.1671	33.42	27.33
21.00	1.1694	33.88	27.67
21.25	1.1718	34.36	28.02
21.50	1.1741	34.82	28.36
21.75	1.1765	35.30	28.72
22.00	1.1789	35.78	29.07
22.25	1.1813	36.26	29.43
22.50	1.1837	36.74	29.78
22.75	1.1861	37.22	30.14
23.00	1.1885	37.70	30.49
23.25	1.1910	38.20	30.86
23.50	1.1934	38.68	31.21
23.75	1.1959	39.18	31.58
24.00	1.1983	39.66	31.94
24.25	1.2008	40.16	32.31
24.50	1.2033	40.66	32.68
24.75	1.2058	41.16	33.05
25.00	1.2083	41.66	33.42
25.25	1.2109	42.18	33.80
25.50	1.2134	42.68	34.17
25.75	1.2160	43.20	34.56
26.00	1.2185	43.70	34.94
26.25	1.2211	44.22	35.33
26.50	1.2236	44.72	35.70
26.75	1.2262	45.24	36.09
27.00	1.2288	45.76	36.48
27.25	1.2314	46.28	36.87
27.50	1.2340	46.80	37.26
27.75	1.2367	47.34	37.67
28.00	1.2393	47.86	38.06
28.25	1.2420	48.40	38.46
28.50	1.2446	48.92	38.85
28.75	1.2473	49.46	39.25
29.00	1.2500	50.00	39.66
29.25	1.2527	50.54	40.06
29.50	1.2554	51.08	40.47
29.75	1.2582	51.64	40.89
30.00	1.2609	52.18	41.30
30.25	1.2637	52.74	41.72
30.50	1.2664	53.28	42.14
30.75	1.2692	53.84	42.58
31.00	1.2719	54.38	43.00
31.25	1.2747	54.94	43.44
31.50	1.2775	55.50	43.89
31.75	1.2804	56.08	44.34
32.00	1.2832	56.64	44.78
32.25	1.2861	57.22	45.24

Degrees Baumé.	Sp. Gr. $\frac{60°}{60°}$ F.	Degrees Twaddell.	Per Cent HNO_3.	Degrees Baumé.	Sp. Gr. $\frac{60°}{60°}$ F.	Degrees Twaddell.	Per Cent HNO_3.
32.50	1.2889	57.78	45.68	40.75	1.3909	78.18	63.48
32.75	1.2918	58.36	46.14	41.00	1.3942	78.84	64.20
33.00	1.2946	58.92	46.58	41.25	1.3976	79.52	64.93
33.25	1.2975	59.50	47.04	41.50	1.4010	80.20	65.67
33.50	1.3004	60.08	47.49	41.75	1.4044	80.88	66.42
33.75	1.3034	60.68	47.95	42.00	1.4078	81.56	67.18
34.00	1.3063	61.26	48.42	42.25	1.4112	82.24	67.95
34.25	1.3093	61.86	48.90	42.50	1.4146	82.92	68.73
34.50	1.3122	62.44	49.35	42.75	1.4181	83.62	69.52
34.75	1.3152	63.04	49.83	43.00	1.4216	84.32	70.33
35.00	1.3182	63.64	50.32	43.25	1.4251	85.02	71.15
35.25	1.3212	64.24	50.81	43.50	1.4286	85.72	71.98
35.50	1.3242	64.84	51.30	43.75	1.4321	86.42	72.82
35.75	1.3273	65.46	51.80	44.00	1.4356	87.12	73.67
36.00	1.3303	66.06	52.30	44.25	1.4392	87.84	74.53
36.25	1.3334	66.68	52.81	44.50	1.4428	88.56	75.40
36.50	1.3364	67.28	53.32	44.75	1.4464	89.28	76.28
36.75	1.3395	67.90	53.84	45.00	1.4500	90.00	77.17
37.00	1.3426	68.52	54.36	45.25	1.4536	90.72	78.07
37.25	1.3457	69.14	54.89	45.50	1.4573	91.46	79.03
37.50	1.3488	69.76	55.43	45.75	1.4610	92.20	80.04
37.75	1.3520	70.40	55.97	46.00	1.4646	92.92	81.08
38.00	1.3551	71.02	56.52	46.25	1.4684	93.68	82.18
38.25	1.3583	71.66	57.08	46.50	1.4721	94.42	83.33
38.50	1.3615	72.30	57.65	46.75	1.4758	95.16	84.48
38.75	1.3647	72.94	58.23	47.00	1.4796	95.92	85.70
39.00	1.3679	73.58	58.82	47.25	1.4834	96.68	86.98
39.25	1.3712	74.24	59.43	47.50	1.4872	97.44	88.32
39.50	1.3744	74.88	60.06	47.75	1.4910	98.20	89.76
39.75	1.3777	75.54	60.71	48.00	1.4948	98.96	91.35
40.00	1.3810	76.20	61.38	48.25	1.4987	99.74	93.13
40.25	1.3843	76.86	62.07	48.50	1.5026	100.52	95.11
40.50	1.3876	77.52	62.77				

Specific Gravity determinations were made at 60° F., compared with water at 60° F.

From the Specific Gravities, the corresponding degrees Baumé were calculated by the following formula:

$$\text{Baumé} = 145 - \frac{145}{\text{Sp. Gr.}}.$$

Baumé Hydrometers for use with this table must be graduated by the above formula, which formula should always be printed on the scale.

Atomic weights from F. W. Clarke's table of 1901. O = 16.

ALLOWANCE FOR TEMPERATURE:

At 10° — 20° Bé. — 1/30° Bé. or .00029 Sp. Gr. = 1° F.
20° — 30° Bé. — 1/23° Bé. or .00044 " " = 1° F.
30° — 40° Bé. — 1/20° Bé. or .00060 " " = 1° F.
40° — 48.5° Bé. — 1/17° Bé. or .00084 " " = 1° F.

AUTHORITY — W. C. FERGUSON.

This table has been approved and adopted as a Standard by the Manufacturing Chemists' Association of the United States.

W. H. BOWER, JAS. L. MORGAN,
HENRY HOWARD, ARTHUR WYMAN,
A. G. ROSENGARTEN, *Executive Committee*

New York, May 14, 1903.

XLI. — NITRIC ACID

LUNGE AND REY

Specific Gravity $\frac{15°}{4°}$ in vacuo	100 parts by weight contain % N_2O_5	% HNO_3	1 liter contains grams N_2O_5	HNO_3	Specific Gravity $\frac{15°}{4°}$ in vacuo	100 parts by weight contain % N_2O_5	% HNO_3	1 liter contains grams N_2O_5	HNO_3
1.000	0.08	0.10	1	1	1.195	27.10	31.62	324	378
1.005	0.85	1.00	8	10	1.200	27.74	32.36	333	388
1.010	1.62	1.90	16	19	1.205	28.36	33.09	342	399
1.015	2.39	2.80	24	28	1.210	28.99	33.82	351	409
1.020	3.17	3.70	33	38	1.215	29.61	34.55	360	420
1.025	3.94	4.60	40	47	1.220	30.24	35.28	369	430
1.030	4.71	5.50	49	57	1.225	30.88	36.03	378	441
1.035	5.47	6.38	57	66	1.230	31.53	36.78	387	452
1.040	6.22	7.26	64	75	1.235	32.17	37.53	397	463
1.045	6.97	8.13	73	85	1.240	32.82	38.29	407	475
1.050	7.71	8.99	81	94	1.245	33.47	39.05	417	486
1.055	8.43	9.84	89	104	1.250	34.13	39.82	427	498
1.060	9.15	10.68	97	113	1.255	34.78	40.58	437	509
1.065	9.87	11.51	105	123	1.260	35.44	41.34	447	521
1.070	10.57	12.33	113	132	1.265	36.09	42.10	457	533
1.075	11.27	13.15	121	141	1.270	36.75	42.87	467	544
1.080	11.96	13.95	129	151	1.275	37.41	43.64	477	556
1.085	12.64	14.74	137	160	1.280	38.07	44.41	487	568
1.090	13.31	15.53	145	169	1.285	38.73	45.18	498	581
1.095	13.99	16.32	153	179	1.290	39.39	45.95	508	593
1.100	14.67	17.11	161	188	1.295	40.05	46.72	519	605
1.105	15.34	17.89	170	198	1.300	40.71	47.49	529	617
1.110	16.00	18.67	177	207	1.305	41.37	48.26	540	630
1.115	16.67	19.45	186	217	1.310	42.06	49.07	551	643
1.120	17.34	20.23	195	227	1.315	42.76	49.89	562	656
1.125	18.00	21.00	202	236	1.320	43.47	50.71	573	669
1.130	18.66	21.77	211	246	1.325	44.17	51.53	585	683
1.135	19.32	22.54	219	256	1.330	44.89	52.37	597	697
1.140	19.98	23.31	228	266	1.3325	45.26	52.80	603	704
1.145	20.64	24.08	237	276	1.335	45.62	53.22	609	710
1.150	21.29	24.84	245	286	1.340	46.35	54.07	621	725
1.155	21.94	25.60	254	296	1.345	47.08	54.93	633	739
1.160	22.60	26.36	262	306	1.350	47.82	55.79	645	753
1.165	23.25	27.12	271	316	1.355	48.57	56.66	658	768
1.170	23.90	27.88	279	326	1.360	49.35	57.57	671	783
1.175	24.54	28.63	288	336	1.365	50.13	58.48	684	798
1.180	25.18	29.38	297	347	1.370	50.91	59.39	698	814
1.185	25.83	30.13	306	357	1.375	51.69	60.30	711	829
1.190	26.47	30.88	315	367	1.380	52.52	61.27	725	846

Specific Gravity $\frac{15^\circ}{4^\circ}$ in vacuo	100 parts by weight contain		1 liter contains grams		Specific Gravity $\frac{15^\circ}{4^\circ}$ in vacuo	100 parts by weight contain		1 liter contains grams	
	% N_2O_5	% HNO_3	N_2O_5	HNO_3		% N_2O_5	% HNO_3	N_2O_5	HNO_3
1.3833	53.08	61.92	735	857	1.495	78.52	91.60	1174	1369
1.385	53.35	62.24	739	862	1.500	80.65	94.09	1210	1411
1.390	54.20	63.23	753	879	1.501	81.09	94.60	1217	1420
1.395	55.07	64.25	768	896	1.502	81.50	95.08	1224	1428
1.400	55.97	65.30	783	914	1.503	81.91	95.55	1231	1436
1.405	56.92	66.40	800	933	1.504	82.29	96.00	1238	1444
1.410	57.86	67.50	816	952	1.505	82.63	96.39	1244	1451
1.415	58.83	68.63	832	971	1.506	82.94	96.76	1249	1457
1.420	59.83	69.80	849	991	1.507	83.26	97.13	1255	1464
1.425	60.84	70.98	867	1011	1.508	83.58	97.50	1260	1470
1.430	61.86	72.17	885	1032	1.509	83.87	97.84	1265	1476
1.435	62.91	73.39	903	1053	1.510	84.09	98.10	1270	1481
1.440	64.01	74.68	921	1075	1.511	84.28	98.32	1274	1486
1.445	65.13	75.98	941	1098	1.512	84.46	98.53	1277	1490
1.450	66.24	77.28	961	1121	1.513	84.63	98.73	1280	1494
1.455	67.38	78.60	981	1144	1.514	84.78	98.90	1283	1497
1.460	68.56	79.98	1001	1168	1.515	84.92	99.07	1287	1501
1.465	69.79	81.42	1023	1193	1.516	85.04	99.21	1289	1504
1.470	71.06	82.90	1045	1219	1.517	85.15	99.34	1292	1507
1.475	72.39	84.45	1068	1246	1.518	85.26	99.46	1294	1510
1.480	73.76	86.05	1092	1274	1.519	85.35	99.57	1296	1512
1.485	75.18	87.70	1116	1302	1.520	85.44	99.67	1299	1515
1.490	76.80	89.60	1144	1335					

XLII. — HYDROCHLORIC ACID

By W. C. Ferguson

Degrees Baumé.	Sp. Gr.	Degrees Twaddell.	Per Cent HCl.	Degrees Baumé.	Sp. Gr.	Degrees Twaddell.	Per Cent HCl.
1.00	1.0069	1.38	1.40	14.25	1.1090	21.80	21.68
2.00	1.0140	2.80	2.82	14.50	1.1111	22.22	22.09
3.00	1.0211	4.22	4.25	14.75	1.1132	22.64	22.50
4.00	1.0284	5.68	5.69	15.00	1,1154	23.08	22.92
5.00	1.0357	7.14	7.15	15.25	1.1176	23.52	23.33
5.25	1.0375	7.50	7.52	15.50	1.1197	23.94	23.75
5.50	1.0394	7.88	7.89	15.75	1.1219	24.38	24.16
5.75	1.0413	8.26	8.26	16.0	1.1240	24.80	24.57
6.00	1.0432	8.64	8.64	16.1	1.1248	24.96	24.73
6.25	1.0450	9.00	9.02	16.2	1.1256	25.12	24.90
6.50	1.0469	9.38	9.40	16.3	1.1265	25.30	25.06
6.75	1.0488	9.76	9.78	16.4	1.1274	25.48	25.23
7.00	1.0507	10.14	10.17	16.5	1.1283	25.66	25.39
7.25	1.0526	10.52	10.55	16.6	1.1292	25.84	25.56
7.50	1.0545	10.90	10.94	16.7	1.1301	26.02	25.72
7.75	1.0564	11.28	11.32	16.8	1.1310	26.20	25.89
8.00	1.0584	11.68	11.71	16.9	1.1319	26.38	26.05
8.25	1.0603	12.06	12.09	17.0	1.1328	26.56	26.22
8.50	1.0623	12.46	12.48	17.1	1.1336	26.72	26.39
8.75	1.0642	12.84	12.87	17.2	1.1345	26.90	26.56
9.00	1.0662	13.24	13.26	17.3	1.1354	27.08	26.73
9.25	1.0681	13.62	13.65	17.4	1.1363	27.26	26.90
9.50	1.0701	14.02	14.04	17.5	1.1372	27.44	27.07
9.75	1.0721	14.42	14.43	17.6	1.1381	27.62	27.24
10.00	1.0741	14.82	14.83	17.7	1.1390	27.80	27.41
10.25	1.0761	15.22	15.22	17.8	1.1399	27.98	27.58
10.50	1.0781	15.62	15.62	17.9	1.1408	28.16	27.75
10.75	1.0801	16.02	16.01	18.0	1.1417	28.34	27.92
11.00	1.0821	16.42	16.41	18.1	1.1426	28.52	28.09
11.25	1.0841	16.82	16.81	18.2	1.1435	28.70	28.26
11.50	1.0861	17.22	17.21	18.3	1.1444	28.88	28.44
11.75	1.0881	17.62	17.61	18.4	1.1453	29.06	28.61
12.00	1.0902	18.04	18.01	18.5	1.1462	29.24	28.78
12.25	1.0922	18.44	18.41	18.6	1.1471	29.42	28.95
12.50	1.0943	18.86	18.82	18.7	1.1480	29.60	29.13
12.75	1.0964	19.28	19.22	18.8	1.1489	29.78	29.30
13.00	1.0985	19.70	19.63	18.9	1.1498	29.96	29.48
13.25	1.1006	20.12	20.04	19.0	1.1508	30.16	29.65
13.50	1.1027	20.54	20.45	19.1	1.1517	30.34	29.83
13.75	1.1048	20.96	20.86	19.2	1.1526	30.52	30.00
14.00	1.1069	21.38	21.27	19.3	1.1535	30.70	30.18

Degrees Baumé.	Sp. Gr.	Degrees Twaddell.	Per Cent HCl.	Degrees Baumé.	Sp. Gr.	Degrees Twaddell.	Per Cent HCl.
19.4	1.1544	30.88	30.35	22.5	1.1836	36.72	36.16
19.5	1.1554	31.08	30.53	22.6	1.1846	36.92	36.35
19.6	1.1563	31.26	30.71	22.7	1.1856	37.12	36.54
19.7	1.1572	31.44	30.90	22.8	1.1866	37.32	36.73
19.8	1.1581	31.62	31.08	22.9	1.1875	37.50	36.93
19.9	1.1590	31.80	31.27	23.0	1.1885	37.70	37.14
20.0	1.1600	32.00	31.45	23.1	1.1895	37.90	37.36
20.1	1.1609	32.18	31.64	23.2	1.1904	38.08	37.58
20.2	1.1619	32.38	31.82	23.3	1.1914	38.28	37.80
20.3	1.1628	32.56	32.01	23.4	1.1924	38.48	38.03
20.4	1.1637	32.74	32.19	23.5	1.1934	38.68	38.26
20.5	1.1647	32.94	32.38	23.6	1.1944	38.88	38.49
20.6	1.1656	33.12	32.56	23.7	1.1953	39.06	38.72
20.7	1.1666	33.32	32.75	23.8	1.1963	39.26	38.95
20.8	1.1675	33.50	32.93	23.9	1.1973	39.46	39.18
20.9	1.1684	33.68	33.12	24.0	1.1983	39.66	39.41
21.0	1.1694	33.88	33.31	24.1	1.1993	39.86	39.64
21.1	1.1703	34.06	33.50	24.2	1.2003	40.06	39.86
21.2	1.1713	34.26	33.69	24.3	1.2013	40.26	40.09
21.3	1.1722	34.44	33.88	24.4	1.2023	40.46	40.32
21.4	1.1732	34.64	34.07	24.5	1.2033	40.66	40.55
21.5	1.1741	34.82	34.26	24.6	1.2043	40.86	40.78
21.6	1.1751	35.02	34.45	24.7	1.2053	41.06	41.01
21.7	1.1760	35.20	34.64	24.8	1.2063	41.26	41.24
21.8	1.1770	35.40	34.83	24.9	1.2073	41.46	41.48
21.9	1.1779	35.58	35.02	25.0	1.2083	41.66	41.72
22.0	1.1789	35.78	35.21	25.1	1.2093	41.86	41.99
22.1	1.1798	35.96	35.40	25.2	1.2103	42.06	42.30
22.2	1.1808	36.16	35.59	25.3	1.2114	42.28	42.64
22.3	1.1817	36.34	35.78	25.4	1.2124	42.48	43.01
22.4	1.1827	36.54	35.97	25.5	1.2134	42.68	43.40

Sp. Gr. determinations were made at 60° F., compared with water at 60° F.
From the Specific Gravities, the corresponding degrees Baumé were calculated by the following formula: Baumé = 145 − 145/Sp. Gr.
Atomic weights from F. W. Clarke's table of 1901. O = 16.

ALLOWANCE FOR TEMPERATURE:

10–15° Bé. – 1/40° Bé. or .0002 Sp. Gr. for 1° F.
15–22° Bé. – 1/30° Bé. or .0003 " " " 1° F.
22–25° Bé. – 1/28° Bé. or .00035 " " " 1° F.

AUTHORITY — W. C. FERGUSON.

This table has been approved and adopted as a Standard by the Manufacturing Chemists' Association of the United States.

W. H. BOWER, JAS. L. MORGAN,
HENRY HOWARD, ARTHUR WYMAN.
A. G. ROSENGARTEN,

New York, May 14, 1903. *Executive Committee*

XLIII. — HYDROCHLORIC ACID

LUNGE AND MARCHLEWSKI

Specific Gravity. $\frac{15^\circ}{4^\circ}$ in Vacuo.	Per Cent HCl by Weight.	1 Liter contains Grams HCl.	Specific Gravity $\frac{15^\circ}{4^\circ}$ in Vacuo.	Per Cent HCl by Weight.	1 Liter contains Grams HCl.	Specific Gravity $\frac{15^\circ}{4^\circ}$ in Vacuo.	Per Cent HCl by Weight.	1 Liter contains Grams HCl.
1.000	0.16	1.6	1.075	15.16	163	1.145	28.61	328
1.005	1.15	12	1.080	16.15	174	1.150	29.57	340
1.010	2.14	22	1.085	17.13	186	1.152	29.95	345
1.015	3.12	32	1.090	18.11	197	1.155	30.55	353
1.020	4.13	42	1.095	19.06	209	1.160	31.52	366
1.025	5.15	53	1.100	20.01	220	1.163	32.10	373
1.030	6.15	64	1.105	20.97	232	1.165	32.49	379
1.035	7.15	74	1.110	21.92	243	1.170	33.46	392
1.040	8.16	85	1.115	22.86	255	1.171	33.65	394
1.045	9.16	96	1.120	23.82	267	1.175	34.42	404
1.050	10.17	107	1.125	24.78	278	1.180	35.39	418
1.055	11.18	118	1.130	25.75	291	1.185	36.31	430
1.060	12.19	129	1.135	26.70	303	1.190	37.23	443
1.065	13.19	141	1.140	27.66	315	1.195	38.16	456
1.070	14.17	152	1.1425	28.14	322	1.200	39.11	469

COMPOSITION OF CONSTANT BOILING HYDROCHLORIC ACID *

Pressure mm. of Mercury.	Per Cent of HCl.	Grams constant boiling distillate for 1 mol. HCl.
770	20.218	180.390
760	20.242	180.170
750	20.266	179.960
740	20.290	179.745
730	20.314	179.530

Temperature of constant boiling hydrochloric acid is 108.54° at 763 mm. Specific gravity 1.09620^{25}.

* Hulett and Bonner, Jour. Am. Chem. Soc. xxxi, 390.

XLIV.—ACETIC ACID AT 15°

OUDEMANS

Specific Gravity.	Per Cent $H.C_2H_3O_2$.	Specific Gravity.	Per Cent $H.C_2H_3O_2$.	Specific Gravity.	Per Cent $H.C_2H_3O_2$.	Specific Gravity.	Per Cent $H.C_2H_3O_2$.
0.9992	0	1.0363	26	1.0623	51	1.0747	76
1.0007	1	1.0375	27	1.0631	52	1.0748	77
1.0022	2	1.0388	28	1.0638	53	1.0748	78
1.0037	3	1.0400	29	1.0646	54	1.0748	79
1.0052	4	1.0412	30	1.0653	55	1.0748	80
1.0067	5	1.0424	31	1.0660	56	1.0747	81
1.0083	6	1.0436	32	1.0666	57	1.0746	82
1.0098	7	1.0447	33	1.0673	58	1.0744	83
1.0113	8	1.0459	34	1.0679	59	1.0742	84
1.0127	9	1.0470	35	1.0685	60	1.0739	85
1.0142	10	1.0481	36	1.0691	61	1.0736	86
1.0157	11	1.0492	37	1.0697	62	1.0731	87
1.0171	12	1.0502	38	1.0702	63	1.0726	88
1.0185	13	1.0513	39	1.0707	64	1.0720	89
1.0200	14	1.0523	40	1.0712	65	1.0713	90
1.0214	15	1.0533	41	1.0717	66	1.0705	91
1.0228	16	1.0543	42	1.0721	67	1.0696	92
1.0242	17	1.0552	43	1.0725	68	1.0686	93
1.0256	18	1.0562	44	1.0729	69	1.0674	94
1.0270	19	1.0571	45	1.0733	70	1.0660	95
1.0284	20	1.0580	46	1.0737	71	1.0644	96
1.0298	21	1.0589	47	1.0740	72	1.0625	97
1.0311	22	1.0598	48	1.0742	73	1.0604	98
1.0324	23	1.0607	49	1.0744	74	1.0580	99
1.0337	24	1.0615	50	1.0746	75	1.0553	100
1.0350	25						

MELTING POINTS OF ACETIC ACID

RUDORFF, Ber. **3**, 390.

100 gr. $H.C_2H_3O_2$ mixed with gr. water.	100 parts by weight contain parts water.	Melting (solidifying) point °C.	100 gr. $H.C_2H_3O_2$ mixed with gr. water.	100 parts by weight contain parts water.	Melting (solidifying) point °C.
0.0	0.0	16.7°	8.0	7.407	6.25°
0.5	0.497	15.65	9.0	8.257	5.3
1.0	0.990	14.8	10.0	9.090	4.3
1.5	1.477	14.0	11.0	9.910	3.6
2.0	1.961	13.25	12.0	10.774	2.7
3.0	2.912	11.95	15.0	13.043	−0.2
4.0	3.846	10.5	18.0	15.324	−2.6
5.0	4.761	9.4	21.0	17.355	−5.1
6.0	5.660	8.2	24.0	19.354	−7.4
7.0	6.542	7.1			

Boiling point 100% acid 117.8°.

Hager

Specific Gravity.	Per Cent. P_2O_5.	Per Cent. H_3PO_4.	Specific Gravity.	Per Cent. P_2O_5.	Per Cent. H_3PO_4.	Specific Gravity.	Per Cent. P_2O_5.	Per Cent. H_3PO_4.
1.809	68.0	93.67	1.462	46.0	63.37	1.208	24.0	33.06
1.800	67.5	92.99	1.455	45.5	62.68	1.203	23.5	32.37
1.792	67.0	92.30	1.448	45.0	61.99	1.198	23.0	31.68
1.783	66.5	91.61	1.441	44.5	61.30	1.193	22.5	30.99
1.775	66.0	90.92	1.435	44.0	60.61	1.188	22.0	30.31
1.766	65.5	90.23	1.428	43.5	59.92	1.183	21.5	29.62
1.758	65.0	89.54	1.422	43.0	59.23	1.178	21.0	28.93
1.750	64.5	88.85	1.415	42.5	58.55	1.174	20.5	28.24
1.741	64.0	88.16	1.409	42.0	57.86	1.169	20.0	27.55
1.733	63.5	87.48	1.402	41.5	57.17	1.164	19.5	26.86
1.725	63.0	86.79	1.396	41.0	56.48	1.159	19.0	26.17
1.717	62.5	86.10	1.389	40.5	55.79	1.155	18.5	25.48
1.709	62.0	85.41	1.383	40.0	55.10	1.150	18.0	24.80
1.701	61.5	84.72	1.377	39.5	54.41	1.145	17.5	24.11
1.693	61.0	84.03	1.371	39.0	53.72	1.140	17.0	23.42
1.685	60.5	83.34	1.365	38.5	53.04	1.135	16.5	22.73
1.677	60.0	82.65	1.359	38.0	52.35	1.130	16.0	22.04
1.669	59.5	81.97	1.354	37.5	51.66	1.126	15.5	21.35
1.661	59.0	81.28	1.348	37.0	50.97	1.122	15.0	20.66
1.653	58.5	80.59	1.342	36.5	50.28	1.118	14.5	19.97
1.645	58.0	79.90	1.336	36.0	49.59	1.113	14.0	19.28
1.637	57.5	79.21	1.330	35.5	48.90	1.109	13.5	18.60
1.629	57.0	78.52	1.325	35.0	48.21	1.104	13.0	17.91
1.621	56.5	77.83	1.319	34.5	47.52	1.100	12.5	17.22
1.613	56.0	77.14	1.314	34.0	46.84	1.096	12.0	16.53
1.605	55.5	76.45	1.308	33.5	46.15	1.091	11.5	15.84
1.597	55.0	75.77	1.303	33.0	45.46	1.087	11.0	15.15
1.589	54.5	75.08	1.298	32.5	44.77	1.083	10.5	14.46
1.581	54.0	74.39	1.292	32.0	44.08	1.079	10.0	13.77
1.574	53.5	73.70	1.287	31.5	43.39	1.074	9.5	13.09
1.566	53.0	73.01	1.281	31.0	42.70	1.070	9.0	12.40
1.559	52.5	72.32	1.276	30.5	42.01	1.066	8.5	11.71
1.551	52.0	71.63	1.271	30.0	41.33	1.062	8.0	11.02
1.543	51.5	70.94	1.265	29.5	40.64	1.058	7.5	10.33
1.536	51.0	70.26	1.260	29.0	39.95	1.053	7.0	9.64
1.528	50.5	69.57	1.255	28.5	39.26	1.049	6.5	8.95
1.521	50.0	68.88	1.249	28.0	38.57	1.045	6.0	8.26
1.513	49.5	68.19	1.244	27.5	37.88	1.041	5.5	7.57
1.505	49.0	67.50	1.239	27.0	37.19	1.037	5.0	6.89
1.498	48.5	66.81	1.233	26.5	36.50	1.033	4.5	6.20
1.491	48.0	66.12	1.228	26.0	35.82	1.029	4.0	5.51
1.484	47.5	65.43	1.223	25.5	35.13	1.025	3.5	4.82
1.476	47.0	64.75	1.218	25.0	34.44	1.021	3.0	4.13
1.469	46.5	64.06	1.213	24.5	33.75	1.017	2.5	3.44

XLVI. — AQUA AMMONIA

According to W. C. Ferguson

Degrees Baumé.	Sp. Gr. $\frac{60°}{60°}$ F.	Per Cent NH_3.	Degrees Baumé.	Sp. Gr. $\frac{60°}{60°}$ F.	Per Cent NH_3.	Degrees Baumé.	Sp. Gr. $\frac{60°}{60°}$ F.	Per Cent HN_3.
10.00	1.0000	.00	16.50	.9556	11.18	23.00	.9150	23.52
10.25	.9982	.40	16.75	.9540	11.64	23.25	.9135	24.01
10.50	.9964	.80	17.00	.9524	12.10	23.50	.9121	24.50
10.75	.9947	1.21	17.25	.9508	12.56	23.75	.9106	24.99
11.00	.9929	1.62	17.50	.9492	13.02	24.00	.9091	25.48
11.25	.9912	2.04	17.75	.9475	13.49	24.25	.9076	25.97
11.50	.9894	2.46	18.00	.9459	13.96	24.50	.9061	26.46
11.75	.9876	2.88	18.25	.9444	14.43	24.75	.9047	26.95
12.00	.9859	3.30	18.50	.9428	14.90	25.00	.9032	27.44
12.25	.9842	3.73	18.75	.9412	15.37	25.25	.9018	27.93
12.50	.9825	4.16	19.00	.9396	15.84	25.50	.9003	28.42
12.75	.9807	4.59	19.25	.9380	16.32	25.75	.8989	28.91
13.00	.9790	5.02	19.50	.9365	16.80	26.00	.8974	29.40
13.25	.9773	5.45	19.75	.9349	17.28	26.25	.8960	29.89
13.50	.9756	5.88	20.00	.9333	17.76	26.50	.8946	30.38
13.75	.9739	6.31	20.25	.9318	18.24	26.75	.8931	30.87
14.00	.9722	6.74	20.50	.9302	18.72	27.00	.8917	31.36
14.25	.9705	7.17	20.75	.9287	19.20	27.25	.8903	31.85
14.50	.9689	7.61	21.00	.9272	19.68	27.50	.8889	32.34
14.75	.9672	8.05	21.25	.9256	20.16	27.75	.8875	32.83
15.00	.9655	8.49	21.50	.9241	20.64	28.00	.8861	33.32
15.25	.9639	8.93	21.75	.9226	21.12	28.25	.8847	33.81
15.50	.9622	9.38	22.00	.9211	21.60	28.50	.8833	34.30
15.75	.9605	9.83	22.25	.9195	22.08	28.75	.8819	34.79
16.00	.9589	10.28	22.50	.9180	22.56	29.00	.8805	35.28
16.25	.9573	10.73	22.75	.9165	23.04			

Specific Gravity determinations were made at 60° F., compared with water at 60° F.

From the Specific Gravities the corresponding degrees Baumé were calculated by the following formula:

$$\text{Baumé} = \frac{140}{\text{Sp. Gr.}} - 130.$$

* Baumé Hydrometers for use with this table must be graduated by the above formula, which formula should *always* be printed on the scale.

Atomic weights from F. W. Clarke's table of 1901. O = 16.

ALLOWANCE FOR TEMPERATURE

The coefficient of expansion for ammonia solutions, varying with the temperature, correction must be applied according to the following table:

Corrections to be Added for Each Degree Below 60° F.			Corrections to be Subtracted for Each Degree Above 60° F.			
Degrees Baumé.	40° F.	50° F.	70° F.	80° F.	90° F.	100° F.
14° Bé	.015° Bé	.017° Bé	.020° Bé	.022° Bé	.024° Bé	.026° Bé
16°	.021 "	.023 "	.026 "	.028 "	.030 "	.032 "
18°	.027 "	.029 "	.031 "	.033 "	.035 "	.037 "
20°	.033 "	.036 "	.037 "	.038 "	.040 "	.042 "
22°	.039 "	.042 "	.043 "	.045 "	.047 "	
26°	.053 "	.057 "	.057 "	.059 "		

AUTHORITY — W. C. FERGUSON.

This table has been approved and adopted as a Standard by the Manufacturing Chemists' Association of the United States.

W. H. BOWER,
HENRY HOWARD,
JAS. L. MORGAN,
ARTHUR WYMAN,
A. G. ROSENGARTEN,
Executive Committee.

New York, May 14, 1903.

XLVII. — SODIUM HYDROXIDE SOLUTION AT 15°

LUNGE

Specific Gravity.	Degrees Baumé.	Degrees Twaddell.	Per Cent Na_2O.	Per Cent NaOH.	1 Liter contains Grams	
					Na_2O.	NaOH.
1.007	1.0	1.4	0.47	0.61	4	6
1.014	2.0	2.8	0.93	1.20	9	12
1.022	3.1	4.4	1.55	2.00	16	21
1.029	4.1	5.8	2.10	2.70	22	28
1.036	5.1	7.2	2.60	3.35	27	35
1.045	6.2	9.0	3.10	4.00	32	42
1.052	7.2	10.4	3.60	4.64	38	49
1.060	8.2	12.0	4.10	5.29	43	56
1.067	9.1	13.4	4.55	5.87	49	63
1.075	10.1	15.0	5.08	6.55	55	70
1.083	11.1	16.6	5.67	7.31	61	79
1.091	12.1	18.2	6.20	8.00	68	87
1.100	13.2	20.0	6.73	8.68	74	95
1.108	14.1	21.6	7.30	9.42	81	104
1.116	15.1	23.2	7.80	10.06	87	112
1.125	16.1	25.0	8.50	10.97	96	123
1.134	17.1	26.8	9.18	11.84	104	134
1.142	18.0	28.4	9.80	12.64	112	144
1.152	19.1	30.4	10.50	13.55	121	156
1.162	20.2	32.4	11.14	14.37	129	167
1.171	21.2	34.2	11.73	15.13	137	177
1.180	22.1	36.0	12.33	15.91	146	188
1.190	23.1	38.0	13.00	16.77	155	200
1.200	24.2	40.0	13.70	17.67	164	212
1.210	25.2	42.0	14.40	18.58	174	225
1.220	26.1	44.0	15.18	19.58	185	239
1.231	27.2	46.2	15.96	20.59	196	253
1.241	28.2	48.2	16.76	21.42	208	266
1.252	29.2	50.4	17.55	22.64	220	283
1.263	30.2	52.6	18.35	23.67	232	299
1.274	31.2	54.8	19.23	24.81	245	316
1.285	32.2	57.0	20.00	25.80	257	332
1.297	33.2	59.4	20.80	26.83	270	348
1.308	34.1	61.6	21.55	27.80	282	364
1.320	35.2	64.0	22.35	28.83	295	381
1.332	36.1	66.4	23.20	29.93	309	399
1.345	37.2	69.0	24.20	31.22	326	420

Specific Gravity.	Degrees Baumé.	Degrees Twaddell.	Per Cent Na_2O.	Per Cent NaOH.	1 Liter contains Grams	
					Na_2O.	NaOH.
1.357	38.1	71.4	25.17	32.47	342	441
1.370	39.2	74.0	26.12	33.69	359	462
1.383	40.2	76.6	27.10	34.96	375	483
1.397	41.2	79.4	28.10	36.25	392	506
1.410	42.2	82.0	29.05	37.47	410	528
1.424	43.2	84.8	30.08	38.80	428	553
1.438	44.2	87.6	31.00	39.99	446	575
1.453	45.2	90.6	32.10	41.41	466	602
1.468	46.2	93.6	33.20	42.83	487	629
1.483	47.2	96.6	34.40	44.38	510	658
1.498	48.2	99.6	35.70	46.15	535	691
1.514	49.2	102.8	36.90	47.60	559	721
1.530	50.2	106.0	38.00	49.02	581	750

XLVIII. — POTASSIUM HYDROXIDE SOLUTION AT 15°

LUNGE

Specific Gravity.	Degrees Baumé.	Degrees Twaddell.	Per Cent K_2O.	Per Cent KOH.	1 Liter contains Grams	
					K_2O.	KOH.
1.007	1.0	1.4	0.7	0.9	7	9
1.014	2.0	2.8	1.4	1.7	14	17
1.022	3.1	4.4	2.2	2.6	22	26
1.029	4.1	5.8	2.9	3.5	30	36
1.037	5.2	7.4	3.8	4.5	39	46
1.045	6.2	9.0	4.7	5.6	49	58
1.052	7.2	10.4	5.4	6.4	57	67
1.060	8.2	12.0	6.2	7.4	66	78
1.067	9.1	13.4	6.9	8.2	74	83
1.075	10.1	15.0	7.7	9.2	83	99
1.083	11.1	16.6	8.5	10.1	92	109
1.091	12.1	18.2	9.2	10.9	100	119
1.100	13.2	20.0	10.1	12.0	111	132
1.108	14.1	21.6	10.8	12.9	119	143
1.116	15.1	23.2	11.6	13.8	129	153

Specific Gravity.	Degrees Baumé.	Degrees Twaddell.	Per Cent K_2O.	Per Cent KOH.	1 Liter contains Grams	
					K_2O.	KOH.
1.125	16.1	25.0	12.4	14.8	140	167
1.134	17.1	26.8	13.2	15.7	150	178
1.142	18.0	28.4	13.9	16.5	159	183
1.152	19.1	30.4	14.8	17.6	170	203
1.162	20.2	32.4	15.6	18.6	181	216
1.171	21.2	34.2	16.4	19.5	192	228
1.180	22.1	36.0	17.2	20.5	203	242
1 190	23.1	38.0	18.0	21.4	214	255
1.200	24.2	40.0	18.8	22.4	226	269
1.210	25.2	42.0	19.6	23.3	237	282
1.220	26.1	44.0	20.3	24.2	248	295
1.231	27.2	46.2	21.1	25.1	260	309
1.241	28.2	48.2	21.9	26.1	272	324
1.252	29.2	50.4	22.7	27.0	284	338
1.263	30.2	52.6	23.5	28.0	297	353
1.274	31.2	54.8	24.2	28.9	308	368
1.285	32.2	57.0	25.0	29.8	321	385
1.297	33.2	59.4	25.8	30.7	335	398
1.308	34.1	61.6	26.7	31.8	349	416
1.320	35.2	64.0	27.5	32.7	363	432
1.332	36.1	66.4	28.3	33.7	377	449
1.345	37.2	69.0	29.3	34.9	394	469
1.357	38.1	71.4	30.2	35.9	410	487
1.370	39.2	74.0	31.0	36.9	425	506
1.383	40.2	76.6	31.8	37.8	440	522
1.397	41.2	79.4	32.7	38.9	457	543
1.410	42.2	82.0	33.5	39.9	472	563
1.424	43.2	84.8	34.4	40.9	490	582
1.438	44.2	87.6	35.4	42.1	509	605
1.453	45.2	90.6	36.5	43.4	530	631
1.468	46.2	93.6	37.5	44.6	549	655
1.483	47.2	96.6	38.5	45.8	571	679
1.498	48.2	99.6	39.6	47.1	593	706
1.514	49.2	102.8	40.6	48.3	615	731
1.530	50.2	106.0	41.5	49.4	635	756
1.546	51.2	109.2	42.5	50.6	655	779
1.563	52.2	112.6	43.6	51.9	681	811
1.580	53.2	116.0	44.7	53.2	706	840
1.597	54.2	119.4	45.8	54.5	731	870
1.615	55.2	123.0	47.0	55.9	754	905
1.634	56.3	126.8	48.3	57.5	789	940

XLIX. — Sodium Carbonate Solution at 15°

Lunge

Specific Gravity.	Degrees Baumé.	Per Cent Na_2CO_3.	Per Cent $Na_2CO_3 . 10H_2O$.	1 Liter contains Grams	
				Na_2CO_3.	$Na_2CO_3 . 10H_2O$.
1.007	1.0	0.67	1.807	6.8	18.2
1.014	2.0	1.33	3.587	13.5	36.4
1.022	3.1	2.09	5.637	21.4	57.6
1.029	4.1	2.76	7.444	28.4	76.6
1.036	5.1	3.43	9.251	35.5	95.8
1.045	6.2	4.29	11.570	44.8	120.9
1.052	7.2	4.94	13.323	52.0	140.2
1.060	8.2	5.71	15.400	60.5	163.2
1.067	9.1	6.37	17.180	68.0	183.3
1.075	10.1	7.12	19.203	76.5	206.4
1.083	11.1	7.88	21.252	85.3	230.2
1.091	12.1	8.62	23.248	94.0	253.6
1.100	13.2	9.43	25.432	103.7	279.8
1.108	14.1	10.19	27.482	112.9	304.5
1.116	15.1	10.95	29.532	122.2	329.6
1.125	16.1	11.81	31.851	132.9	358.3
1.134	17.1	12.61	34.009	143.0	385.7
1.142	18.0	13.16	35.493	150.3	405.3
1.152	19.1	14.24	38.405	164.1	442.4

L. — Concentrated Sodium Carbonate Solution at 30°

Lunge

Specific Gravity	Degrees Baumé.	Per Cent Na_2CO_3.	Per Cent $Na_2CO_3.10H_2O$.	1 Liter contains Grams	
				Na_2CO_3.	$Na_2CO_3.10H_2O$.
1.142	18.0	13.79	37.21	157.5	425.0
1.152	19.1	14.64	39.51	168.7	455.2
1.162	20.2	15.49	41.79	180.0	485.7
1.171	21.2	16.27	43.89	190.5	514.0
1.180	22.1	17.04	45.97	201.1	542.6
1.190	23.1	17.90	48.31	214.0	577.5
1.200	24.2	18.76	50.62	225.1	607.4
1.210	25.2	19.61	52.91	237.3	640.3
1.220	26.1	20.47	55.29	249.7	673.8
1.231	27.2	21.42	57.80	263.7	711.5
1.241	28.2	22.29	60.15	276.6	746.3
1.252	29.2	23.25	62.73	291.1	785.4
1.263	30.2	24.18	65.24	305.4	824.1
1.274	31.2	25.11	67.76	319.9	863.2
1.285	32.2	26.04	70.28	334.6	902.8
1.297	33.2	27.06	73.02	351.0	947.1
1.308	34.1	27.97	75.48	365.9	987.4

LI. — Correction of Specific Gravity of Sodium Carbonate for ± 1° C.

Lunge

For Temperatures from					For Specific Gravity		
0° to 30°.	30° to 40°.	40° to 50°	50° to 70°.	70° to 100°.	From	To	
0.0002	0.0004	0.0004	0.0005	0.0005	1.010	1.050	At 15°
0.0003	0.0004	0.0004	0.0006	0.0005	1.060	1.070	
0.0004	0.0004	0.0004	0.0006	0.0006	1.080	1.110	
0.0004	0.0004	0.0005	0.0006	0.0006	1.120	1.170	
0.0004	0.0004	0.0006	0.0007	0.0007	1.180	1.200	
0.0005	0.0004	0.0005	0.0007	0.0007	1.210	1.240	
	0.0005	0.0005	0.0007	0.0007	1.241	1.252	At 30°
	0.0005	0.0005	0.0006	0.0008	1.263	1.285	

LII. — Potassium Carbonate Solution at 15°

Calculated from Gerlach

Specific Gravity.	Baumé.	Twaddell.	Per Cent K_2CO_3.	1 Liter contains Grams K_2CO_3.	Specific Gravity.	Baumé.	Twaddell.	Per Cent K_2CO_3.	1 Liter contains Grams K_2CO_3.
1.00914	1.3	1.8	1	10.1	1.27893	31.6	55.8	28	358.1
1.01829	2.6	3.6	2	20.4	1.28999	32.6	58.0	29	374.1
1.02743	3.9	5.4	3	30.8	1.30105	33.6	60.2	30	390.3
1.03658	5.1	7.2	4	41.4	1.31261	34.5	62.5	31	406.9
1.04572	6.3	9.2	5	52.3	1.32417	35.5	64.8	32	423.7
1.05513	7.6	11.0	6	63.3	1.33573	36.4	67.1	33	440.8
1.06454	8.8	12.9	7	74.5	1.34729	37.4	69.5	34	458.1
1.07396	10.0	14.8	8	85.9	1.35885	38.3	71.8	35	475.6
1.08337	11.2	16.6	9	97.5	1.37082	39.2	74.2	36	493.5
1.09278	12.3	18.6	10	109.3	1.38279	40.1	76.6	37	511.6
1.10258	13.5	20.5	11	121.3	1.39476	41.0	79.0	38	530.0
1.11238	14.6	22.4	12	133.5	1.40673	41.9	81.4	39	548.6
1.12219	15.8	24.4	13	145.9	1.41870	42.8	83.7	40	567.5
1.13199	16.9	26.4	14	158.5	1.43104	43.7	86.2	41	586.7
1.14179	18.0	28.3	15	171.3	1.44338	44.5	88.7	42	606.2
1.15200	19.1	30.4	16	184.3	1.45573	45.4	91.1	43	626.0
1.16222	20.2	32.4	17	197.5	1.46807	46.2	93.6	44	646.0
1.17243	21.3	34.5	18	211.0	1.48041	47.1	96.0	45	666.2
1.18265	22.4	36.5	19	224.7	1.49314	47.9	98.6	46	686.8
1.19286	23.4	38.6	20	238.6	1.50588	48.7	101.2	47	707.7
1.20344	24.5	40.7	21	252.7	1.51861	49.5	103.7	48	728.9
1.21402	25.6	42.8	22	267.1	1.53135	50.3	106.3	49	750.4
1.22459	26.6	44.9	23	281.7	1.54408	51.1	108.8	50	772.1
1.23517	27.6	47.0	24	296.5	1.55728	51.9	111.5	51	794.2
1.24575	28.6	49.1	25	311.5	1.57048	52.7	114.1	52	816.7
1.25681	29.6	51.4	26	326.8	1.57079	52.7	114.2	52.024	817.2
1.26787	30.6	53.6	27	342.3					

LIII. — Specific Gravity and Percentage of Alcohol by Volume

Squibb

Per Cent Alcohol by Volume.	Specific Gravity at $\frac{15.56°}{15.56°}$C.	Per Cent Alcohol by Volume.	Specific Gravity at $\frac{15.56°}{15.56°}$C.	Per Cent Alcohol by Volume.	Specific Gravity at $\frac{15.56°}{15.56°}$C.	Per Cent Alcohol by Volume.	Specific Gravity at $\frac{15.56°}{15.56°}$C.
1	0.9985	26	0.9698	51	0.9323	76	0.8745
2	.9970	27	.9691	52	.9303	77	.8721
3	.9956	28	.9678	53	.9283	78	.8696
4	.9942	29	.9665	54	.9262	79	.8664
5	.9930	30	.9652	55	.9242	80	.8639
6	.9914	31	.9643	56	.9221	81	.8611
7	.9898	32	.9631	57	.9200	82	.8581
8	.9890	33	.9618	58	.9178	83	.8557
9	.9878	34	.9609	59	.9160	84	.8526
10	.9869	35	.9593	60	.9135	85	.8496
11	.9855	36	.9578	61	.9113	86	.8466
12	.9841	37	.9565	62	.9090	87	.8434
13	.9828	38	.9550	63	.9069	88	.8408
14	.9821	39	.9535	64	.9047	89	.8373
15	.9815	40	.9519	65	.9025	90	.8340
16	.9802	41	.9503	66	.9001	91	.8305
17	.9789	42	.9490	67	.8973	92	.8272
18	.9778	43	.9470	68	.8949	93	.8237
19	.9766	44	.9452	69	.8925	94	.8199
20	.9760	45	.9434	70	.8900	95	.8164
21	.9753	46	.9416	71	.8875	96	.8125
22	.9741	47	.9396	72	.8850	97	.8084
23	.9728	48	.9381	73	.8825	98	.8041
24	.9716	49	.9362	74	.8799	99	.7995
25	.9709	50	.9343	75	.8769	100	.7946

The tables giving the percentage of alcohol by weight and by volume do not agree with each other. The density of absolute alcohol given by Fownes is .7938 at 15.6° C. (60° F.) compared with water at the same temperature. Under the same conditions Tralles finds a density of .7946. Squibb has shown that the density of absolute alcohol must be at least as low as .7935. This is .003 lower than the density found by Fownes and corresponds to 0.1 per cent of alcohol. The table given by Squibb is based on the values given by Fownes for percentage by weight and those given by Tralles for percentage by volume.

To reduce sp. gr. at $\frac{15.6°}{15.6°}$ to $\frac{15.6°}{4°}$ multiply by .99908 or for

sp. gr. 1.000 to .935 subtract .0009
" .934 to .825 " .0008
" .824 " .0007

LIV. — Percentage of Alcohol by Volume and by Weight*

Gilpin, Drinkwater, and Squibb

Specific Gravity at $\frac{60°}{60°}$F.	Alcohol			Specific Gravity at $\frac{60°}{60°}$F.	Alcohol		
	per cent by volume	per cent by weight	Grams per 100 c.c.		per cent by volume	per cent by weight	Grams per 100 c.c.
1.00000..	0.00	00.0	0.00	.99473..	3.60	2.88	2.86
0.99984.	0.10	0.08	0.08	.99459..	3.70	2.96	2.94
.99968..	0.20	0.16	0.16	.99445..	3.80	3.04	3.02
.99953..	0.30	0.24	0.24	.99431..	3.90	3.12	3.10
.99937..	0.40	0.32	0.32	.99417..	4.00	3.20	3.18
.99923..	0.50	0.40	0.40	.99403..	4.10	3.28	3.26
.99907..	0.60	0.48	0.48	.99390..	4.20	3.36	3.34
.99892..	0.70	0.56	0.56	.99376..	4.30	3.44	3.42
.99877..	0.80	0.64	0.64	.99363..	4.40	3.52	3.50
.99861..	0.90	0.71	0.71	.99349..	4.50	3.60	3.58
.99849..	1.00	0.79	0.79	.99335..	4.60	3.68	3.66
.99834..	1.10	0.87	0.87	.99322..	4.70	3.76	3.74
.99819..	1.20	0.95	0.95	.99308..	4.80	3.84	3.81
.99805..	1.30	1.03	1.03	.99295..	4.90	3.92	3.89
.99790..	1.40	1.11	1.11	.99281..	5.00	4.00	3.97
.99775..	1.50	1.19	1.19	.99268..	5.10	4.08	4.05
.99760..	1.60	1.27	1.27	.99255..	5.20	4.16	4.13
.99745..	1.70	1.35	1.35	.99241..	5.30	4.24	4.21
.99731..	1.80	1.43	1.43	.99228..	5.40	4.32	4.29
.99716..	1.90	1.51	1.51	.99215..	5.50	4.40	4.37
.99701..	2.00	1.59	1.59	.99202..	5.60	4.48	4.44
.99687..	2.10	1.67	1.66	.99189..	5.70	4.56	4.52
.99672..	2.20	1.75	1.74	.99175..	5.80	4.64	4.60
.99658..	2.30	1.83	1.82	.99162..	5.90	4.72	4.68
.99643..	2.40	1.91	1.90	.99149..	6.00	4.80	4.76
.99629..	2.50	1.99	1.98	.99136..	6.10	4.88	4.84
.99615..	2.60	2.07	2.06	.99123..	6.20	4.96	4.92
.99600..	2.70	2.15	2.14	.99111..	6.30	5.05	5.00
.99586..	2.80	2.23	2.22	.99098..	6.40	5.13	5.08
.99571..	2.90	2.31	2.30	.99085..	6.50	5.21	5.16
.99557..	3.00	2.39	2.38	.99072..	6.60	5.29	5.24
.99543..	3.10	2.47	2.46	.99059..	6.70	5.37	5.32
.99529..	3.20	2.55	2.54	.99047..	6.80	5.45	5.40
.99515..	3.30	2.64	2.62	.99034..	6.90	5.53	5.48
.99501..	3.40	2.72	2.70	.99021..	7.00	5.61	5.56
.99487..	3.50	2.80	2.78	.99009..	7.10	5.69	5.64

* Bulletin No. 65, U.S. Department of Agriculture.

Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.	Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.
.98996..	7.20	5.77	5.72	.98513..	11.30	9.11	8.97
.98984..	7.30	5.86	5.80	.98502..	11.40	9.19	9.05
.98971..	7.40	5.94	5.88	.98491..	11.50	9.27	9.13
.98959..	7.50	6.02	5.96	.98479..	11.60	9.35	9.21
.98947..	7.60	6.10	6.04	.98468..	11.70	9.43	9.29
.98934..	7.70	6.18	6.11	.98457..	11.80	9.51	9.36
.98922..	7.80	6.26	6.19	.98446..	11.90	9.59	9.44
.98909..	7.90	6.34	6.27	.98435..	12.00	9.67	9.52
.98897..	8.00	6.42	6.35	.98424..	12.10	9.75	9.60
.98885..	8.10	6.50	6.43	.98413..	12.20	9.83	9.68
.98873..	8.20	6.58	6.51	.98402..	12.30	9.92	9.76
.98861..	8.30	6.67	6.59	.98391..	12.40	10.00	9.84
.98849..	8.40	6.75	6.67	.98381..	12.50	10.08	9.92
.98837..	8.50	6.83	6.75	.98370..	12.60	10.16	10.00
.98825..	8.60	6.91	6.83	.98359..	12.70	10.24	10.07
.98813..	8.70	6.99	6.91	.98348..	12.80	10.33	10.15
.98801..	8.80	7.07	6.99	.98337..	12.90	10.41	10.23
.98789..	8.90	7.15	7.07	.98326..	13.00	10.49	10.31
.98777..	9.00	7.23	7.14	.98315..	13.10	10.57	10.39
.98765..	9.10	7.31	7.22	.98305..	13.20	10.65	10.47
.98754..	9.20	7.39	7.30	.98294..	13.30	10.74	10.55
.98742..	9.30	7.48	7.38	.98283..	13.40	10.82	10.63
.98730..	9.40	7.56	7.46	.98273..	13.50	10.90	10.71
.98719..	9.50	7.64	7.54	.98262..	13.60	10.98	10.79
.98707..	9.60	7.72	7.62	.98251..	13.70	11.06	10.87
.98695..	9.70	7.80	7.70	.98240..	13.80	11.15	10.95
.98683..	9.80	7.88	7.78	.98230..	13.90	11.23	11.03
.98672..	9.90	7.96	7.85	.98219..	14.00	11.31	11.11
.98660..	10.00	8.04	7.93	.98209..	14.10	11.39	11.19
.98649..	10.10	8.12	8.01	.98198..	14.20	11.47	11.27
.98637..	10.20	8.20	8.09	.98188..	14.30	11.56	11.35
.98626..	10.30	8.29	8.17	.98177..	14.40	11.64	11.43
.98614..	10.40	8.37	8.25	.98167..	14.50	11.72	11.51
.98603..	10.50	8.45	8.33	.98156..	14.60	11.80	11.59
.98592..	10.60	8.53	8.41	.98146..	14.70	11.88	11.67
.98580..	10.70	8.61	8.49	.98135..	14.80	11.97	11.75
.98569..	10.80	8.70	8.57	.98125..	14.90	12.05	11.82
.98557..	10.90	8.78	8.65	.98114..	15.00	12.13	11.90
.98546..	11.00	8.86	8.73	.98104..	15.10	12.21	11.98
.98535..	11.10	8.94	8.81	.98093..	15.20	12.29	12.06
.98524..	11.20	9.02	8.89	.98083..	15.30	12.38	12.14

Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.	Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.
.98073..	15.40	12.46	12.22	.97658..	19.50	15.84	15.47
.98063..	15.50	12.54	12.30	.97648..	19.60	15.93	15.55
.98052..	15.60	12.62	12.37	.97638..	19.70	16.01	15.63
.98042..	15.70	12.70	12.45	.97628..	19.80	16.09	15.71
.98032..	15.80	12.79	12.53	.97618..	19.90	16.18	15.79
.98021..	15.90	12.87	12.61	.97608..	20.00	16.26	15.87
.98011..	16.00	12.95	12.69	.97598..	20.10	16.34	15.95
.98001..	16.10	13.03	12.77	.97588..	20.20	16.42	16.03
.97991..	16.20	13.12	12.85	.97578..	20.30	16.51	16.10
.97980..	16.30	13.20	12.93	.97568..	20.40	16.59	16.18
.97970..	16.40	13.29	13.01	.97558..	20.50	16.67	16.26
.97960..	16.50	13.37	13.09	.97547..	20.60	16.75	16.34
.97950..	16.60	13.45	13.17	.97537..	20.70	16.84	16.42
.97940..	16.70	13.53	13.25	.97527..	20.80	16.92	16.50
.97929..	16.80	13.62	13.33	.97517..	20.90	17.01	16.58
.97919..	16.90	13.70	13.41	.97507..	21.00	17.09	16.66
.97909..	17.00	13.78	13.49	.97497..	21.10	17.17	16.74
.97899..	17.10	13.86	13.57	.97487..	21.20	17.26	16.82
.97889..	17.20	13.94	13.65	.97477..	21.30	17.34	16.90
.97879..	17.30	14.03	13.73	.97467..	21.40	17.43	16.98
.97869..	17.40	14.11	13.81	.97457..	21.50	17.51	17.06
.97859..	17.50	14.19	13.89	.97446..	21.60	17.59	17.14
.97848..	17.60	14.27	13.96	.97436..	21.70	17.67	17.22
.97838..	17.70	14.35	14.04	.97426..	21.80	17.76	17.30
.97828..	17.80	14.44	14.12	.97416..	21.90	17.84	17.38
.97818..	17.90	14.52	14.20	.97406..	22.00	17.92	17.46
.97808..	18.00	14.60	14.28	.97396..	22.10	18.00	17.54
.97798..	18.10	14.68	14.36	.97386..	22.20	18.09	17.62
.97788..	18.20	14.77	14.44	.97375..	22.30	18.17	17.70
.97778..	18.30	14.85	14.52	.97365..	22.40	18.26	17.78
.97768..	18.40	14.94	14.60	.97355..	22.50	18.34	17.86
.97758..	18.50	15.02	14.68	.97345..	22.60	18.42	17.94
.97748..	18.60	15.10	14.76	.97335..	22.70	18.51	18.02
.97738..	18.70	15.18	14.84	.97324..	22.80	18.59	18.10
.97728..	18.80	15.27	14.92	.97314..	22.90	18.68	18.18
.97718..	18.90	15.38	15.00	.97304..	23.00	18.76	18.26
.97708..	19.00	15.43	15.08	.97294..	23.10	18.84	18.33
.97698..	19.10	15.51	15.15	.97283..	23.20	18.92	18.41
.97688..	19.20	15.59	15.23	.97273..	23.30	19.01	18.49
.97678..	19.30	15.68	15.31	.97263..	23.40	19.09	18.57
.97668..	19.40	15.76	15.39	.97253..	23.50	19.17	18.65

Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.	Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.
.97242..	23.60	19.25	18.73	.96805..	27.70	22.71	21.98
.97232..	23.70	19.34	18.81	.96794..	27.80	22.79	22.06
.97222..	23.80	19.42	18.88	.96783..	27.90	22.88	22.14
.97211..	23.90	19.51	18.96	.96772..	28.00	22.96	22.22
.97201..	24.00	19.59	19.04	.96761..	28.10	23.04	22.30
.97191..	24.10	19.67	19.12	.96749..	28.20	23.13	22.38
.97180..	24.20	19.76	19.20	.96738..	28.30	23.21	22.45
.97170..	24.30	19.84	19.28	.96726..	28.40	23.30	22.53
.97159..	24.40	19.93	19.36	.96715..	28.50	23.38	22.61
.97149..	24.50	20.01	19.44	.96704..	28.60	23.47	22.69
.97139..	24.60	20.09	19.52	.96692..	28.70	23.55	22.77
.97128..	24.70	20.18	19.60	.96681..	28.80	23.64	22.85
.97118..	24.80	20.26	19.68	.96669..	28.90	23.72	22.93
.97107..	24.90	20.35	19.76	.96658..	29.00	23.81	23.01
.97097..	25.00	20.43	19.84	.96646..	29.10	23.89	23.09
.97086..	25.10	20.51	19.92	.96635..	29.20	23.98	23.17
.97076..	25.20	20.60	20.00	.96623..	29.30	24.06	23.25
.97065..	25.30	20.68	20.08	.96611..	29.40	24.15	23.33
.97055..	25.40	20.77	20.16	.96600..	29.50	24.23	23.41
.97044..	25.50	20.85	20.24	.96587..	29.60	24.32	23.49
.97033..	25.60	20.93	20.32	.96576..	29.70	24.40	23.57
.97023..	25.70	21.02	20.40	.96564..	29.80	24.49	23.65
.97012..	25.80	21.10	20.47	.96553..	29.90	24.57	23.73
.97001..	25.90	21.19	20.55	.96541..	30.00	24.66	23.81
.96991..	26.00	21.27	20.63	.96529..	30.10	24.74	23.89
.96980..	26.10	21.35	20.71	.96517..	30.20	24.83	23.97
.96969..	26.20	21.44	20.79	.96505..	30.30	24.91	24.04
.96959..	26.30	21.52	20.87	.96493..	30.40	25.00	24.12
.96949..	26.40	21.61	20.95	.96481..	30.50	25.08	24.20
.96937..	26.50	21.69	21.03	.96469..	30.60	25.17	24.28
.96926..	26.60	21.77	21.11	.96457..	30.70	25.25	24.36
.96915..	26.70	21.86	21.19	.96445..	30.80	25.34	24.44
.96905..	26.80	21.94	21.27	.96433..	30.90	25.42	24.52
.96894..	26.90	22.03	21.35	.96421..	31.00	25.51	24.60
.96883..	27.00	22.11	21.43	.96409..	31.10	25.60	24.68
.96872..	27.10	22.20	21.51	.96396..	31.20	25.68	24.76
.96861..	27.20	22.28	21.59	.96384..	31.30	25.77	24.84
.96850..	27.30	22.37	21.67	.96372	31.40	25.85	24.92
.96839..	27.40	22.45	21.75	.96360..	31.50	25.94	25.00
.96828..	27.50	22.54	21.83	.96347..	31.60	26.03	25.08
.96816..	27.60	22.62	21.90	.96335..	31.70	26.11	25.16

Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.	Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.
.96323..	31.80	26.20	25.24	.95787..	35.90	29.74	28.49
.96310..	31.90	26.28	25.32	.95773..	36.00	29.83	28.57
.96298..	32.00	26.37	25.40	.95759..	36.10	29.92	28.65
.96285..	32.10	26.46	25.48	.95745..	36.20	30.00	28.73
.96273..	32.20	26.54	25.56	.95731..	36.30	30.09	28.81
.96260..	32.30	26.63	25.64	.95717..	36.40	30.17	28.88
.96248..	32.40	26.71	25.71	.95703..	36.50	30.26	28.96
.96235..	32.50	26.80	25.79	.95688..	36.60	30.35	29.04
.96222..	32.60	26.89	25.87	.95674..	36.70	30.44	29.12
.96210..	32.70	26.97	25.95	.95660..	36.80	30.52	29.20
.96197..	32.80	27.06	26.03	.95646..	36.90	30.61	29.29
.96185..	32.90	27.14	26.11	.95632..	37.00	30.70	29.36
.96172..	33.00	27.23	26.19	.95618..	37.10	30.79	29.44
.96159..	33.10	27.32	26.27	.95603..	37.20	30.88	29.52
.96146..	33.20	27.40	26.35	.95589..	37.30	30.96	29.60
.96133..	33.30	27.49	26.43	.95574..	37.40	31.05	29.68
.96120..	33.40	27.57	26.51	.95560..	37.50	31.14	29.76
.96108..	33.50	27.66	26.59	.95545..	37.60	31.23	29.84
.96095..	33.60	27.75	26.67	.95531..	37.70	31.32	29.92
.96082..	33.70	27.83	26.75	.95516..	37.80	31.40	30.00
.96069..	33.80	27.92	26.82	.95502..	37.90	31.49	30.08
.96056..	33.90	28.00	26.90	.95487..	38.00	31.58	30.16
.96043..	34.00	28.09	26.98	.95472..	38.10	31.67	30.24
.96030..	34.10	28.18	27.06	.95457..	38.20	31.76	30.32
.96016..	34.20	28.26	27.14	.95442..	38.30	31.85	30.40
.96003..	34.30	28.35	27.22	.95427..	38.40	31.94	30.48
.95990..	34.40	28.43	27.30	.95413..	38.50	32.03	30.56
.95977..	34.50	28.52	27.38	.95398..	38.60	32.12	30.64
.95963..	34.60	28.61	27.46	.95383..	30.70	32.20	30.72
.95950..	34.70	28.70	27.54	.95368..	30.80	32.29	30.79
.95937..	34.80	28.78	27.62	.95353..	30.90	32.37	30.87
.95923..	34.90	28.87	27.70	.95338..	39.00	32.46	30.95
.95910..	35.00	28.96	27.78	.95323..	39.10	32.55	31.03
.95896..	35.10	29.05	27.86	.95307..	39.20	32.64	31.11
.95883..	35.20	29.13	27.94	.95292..	39.30	32.72	31.18
.95869..	35.30	29.22	28.02	.95277..	39.40	32.81	31.26
.95855..	35.40	29.30	28.09	.95262..	39.50	32.90	31.34
.95842..	35.50	29.38	28.17	.95246..	39.60	32.99	31.42
.95828..	35.60	29.48	28.25	.95231..	39.70	33.08	31.50
.95814..	35.70	29.57	28.33	.95216..	39.80	33.17	31.58
.95800..	35.80	29.65	28.41	.95200..	39.90	33.27	31.66

Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.	Specific Gravity at $\frac{60°}{60°}$F.	Alcohol per cent by volume	Alcohol per cent by weight	Alcohol Grams per 100 c.c.
.95185..	40.00	33.35	31.74	.94519..	44.10	37.02	34.99
.95169..	40.10	33.44	31.82	.94502..	44.20	37.11	35.07
.95154..	40.20	33.53	31.90	.94484..	44.30	37.21	35.15
.95138..	40.30	33.61	31.98	.94467..	44.40	37.30	35.23
.95122..	40.40	33.70	32.06	.94450..	44.50	37.39	35.31
.95107..	40.50	33.79	32.14	.94433..	44.60	37.48	35.39
.95091..	40.60	33.88	32.22	.94416..	44.70	37.57	35.47
.95075..	40.70	33.97	32.30	.94398..	44.80	37.66	35.55
.95059..	40.80	34.06	32.38	.94381..	44.90	37.76	35.63
.95044..	40.90	34.15	32.46	.94364..	45.00	37.84	35.71
.95028..	41.00	34.24	32.54	.94346..	45.10	37.93	35.79
.95012..	41.10	34.33	32.62	.94329..	45.20	38.02	35.87
.94996..	41.20	34.42	32.70	.94311..	45.30	38.12	35.95
.94980..	41.30	34.50	32.78	.94294..	45.40	38.21	36.03
.94964..	41.40	34.59	32.86	.94276..	45.50	38.30	36.11
.94948..	41.50	34.68	32.93	.94258..	45.60	38.39	36.19
.94932..	41.60	34.77	33.01	.94241..	45.70	38.48	36.26
.94916..	41.70	34.86	33.09	.94223..	45.80	38.57	36.34
.94900..	41.80	34.95	33.17	.94206..	45.90	38.66	36.42
.94884..	41.90	35.04	33.25	.94188..	46.00	38.75	36.50
.94868..	42.00	35.13	33.33	.94170..	46.10	38.84	36.58
.94852..	42.10	35.22	33.41	.94152..	46.20	38.93	36.66
.94835..	42.20	35.31	33.49	.94134..	46.30	39.03	36.74
.94810..	42.30	35.40	33.57	.94116..	46.40	39.12	36.82
.94802..	42.40	35.49	33.65	.94098..	46.50	39.21	36.90
.94786..	42.50	35.58	33.73	.94080	46.60	39.30	36.98
.94770..	42.60	35.67	33.81	.94062..	46.70	39.39	37.06
.94753..	42.70	35.76	33.89	.94044..	46.80	39.49	37.13
.94737..	42.80	35.85	33.97	.94026..	46.90	39.58	37.21
.94720..	42.90	35.94	34.04	.94008..	47.00	39.67	37.29
.94704..	43.00	36.03	34.12	.93990..	47.10	39.76	37.37
.94687..	43.10	36.12	34.20	.93971..	47.20	39.85	37.45
.94670..	43.20	36.21	34.28	.93953..	47.30	39.95	37.53
.94654..	43.30	36.30	34.36	.93934..	47.40	40.04	37.61
.94637..	43.40	36.39	34.44	.93916..	47.50	40.13	37.69
.94620..	43.50	36.48	34.52	.93898..	47.60	40.22	37.77
.94603..	43.60	36.57	34.60	.93879..	47.70	40.32	37.85
.94586..	43.70	36.66	34.68	.93861..	47.80	40.41	37.93
.94570..	43.80	36.75	34.76	.93842..	47.90	40.51	38.01
.94553..	43.90	36.84	34.84	.93824..	48.00	40.60	38.09
.94536..	44.00	36.93	34.91	.93805..	48.10	40.69	38.17

Specific Gravity at $\frac{60°}{60°}$ F.	Alcohol. Per Cent by Volume.	Alcohol. Per Cent by Weight.	Alcohol. Grams per 100 c.c.	Specific Gravity at $\frac{60°}{60°}$ F.	Alcohol. Per Cent by Volume.	Alcohol. Per Cent by Weight.	Alcohol. Grams per 100 c.c.
.93786..	48.20	40.78	38.25	.93617..	49.10	41.61	38.96
.93768..	48.30	40.88	38.33	.93598..	49.20	41.71	39.04
.93749..	48.40	40.97	38.41	.93578..	49.30	41.80	39.12
.93730..	48.50	41.06	38.49	.93559..	49.40	41.90	39.20
93711..	48.60	41.15	38.57	.93540..	49.50	41.99	39.28
93692..	48.70	41.24	38.65	.93521..	49.60	42.08	39.36
.93679..	48.80	41.34	38.72	.93502..	49.70	42.18	39.44
.93655..	48.90	41.43	38.80	.93482..	49.80	42.27	39.52
.93636..	49.00	41.52	38.88	.93463..	49.90	42.37	39.60

ALCOHOL TABLES OF THE BUREAU OF STANDARDS

LV. — Density of Mixtures of Ethyl Alcohol and Water

Per Cent Alcohol by Weight.	$D\frac{15}{4}$.*	$D\frac{20}{4}$.	$D\frac{25}{4}$.	Per Cent Alcohol by Weight.	$D\frac{15}{4}$.	$D\frac{20}{4}$.	$D\frac{25}{4}$.
0	0.99913	0.99824	0.99708	15	0.97683	0.97522	0.97336
1	0.99725	0.99636	0.99521	16	0.97563	0.97393	0.97199
2	0.99543	0.99453	0.99338	17	0.97444	0.97264	0.97061
3	0.99366	0.99274	0.99159	18	0.97324	0.97134	0.96922
4	0.99197	0.99102	0.98984	19	0.97203	0.97003	0.96782
5	0.99033	0.98936	0.98815	20	0.97080	0.96870	0.96640
6	0.98877	0.98776	0.98651	21	0.96956	0.96736	0.96497
7	0.98726	0.98620	0.98491	22	0.96829	0.96599	0.96352
8	0.98581	0.98470	0.98336	23	0.96699	0.96459	0.96203
9	0.98442	0.98325	0.98185	24	0.96566	0.96317	0.96052
10	0.98307	0.98185	0.98038	25	0.96430	0.96171	0.95897
11	0.98176	0.98047	0.97893	26	0.96289	0.96021	0.95739
12	0.98049	0.97913	0.97752	27	0.96145	0.95868	0.95577
13	0.97925	0.97781	0.97612	28	0.95997	0.95711	0.95412
14	0.97803	0.97651	0.97474	29	0.95845	0.95550	0.95244

* $D\frac{15}{4}$ = density at 15° C. referred to water at 4° C.

Per Cent Alcohol by Weight.	$D\frac{15}{4}$.*	$D\frac{20}{4}$.	$D\frac{25}{4}$.	Per Cent Alcohol by Weight.	$D\frac{15}{4}$.	$D\frac{20}{4}$.	$D\frac{25}{4}$.
30	0.95688	0.95385	0.95071	65	0.88368	0.87950	0.87530
31	0.95526	0.95215	0.94894	66	0.88134	0.87716	0.87295
32	0.95360	0.95042	0.94713	67	0.87899	0.87480	0.87058
33	0.95191	0.94865	0.94529	68	0.87664	0.87244	0.86821
34	0.95017	0.94684	0.94342	69	0.87428	0.87008	0.86583
35	0.94839	0.94499	0.94152	70	0.87192	0.86770	0.86344
36	0.94657	0.94311	0.93957	71	0.86954	0.86532	0.86105
37	0.94471	0.94119	0.93760	72	0.86716	0.86292	0.85864
38	0.94282	0.93924	0.93560	73	0.86477	0.86052	0.85622
39	0.94089	0.93725	0.93356	74	0.86237	0.85812	0.85380
40	0.93893	0.93524	0.93151	75	0.85997	0.85570	0.85137
41	0.93694	0.93320	0.92943	76	0.85755	0.85328	0.84893
42	0.93491	0.93113	0.92732	77	0.85513	0.85084	0.84648
43	0.93286	0.92904	0.92519	78	0.85270	0.84840	0.84403
44	0.93078	0.92693	0.92305	79	0.85026	0.84595	0.84157
45	0.92868	0.92480	0.92088	80	0.84781	0.84349	0.83909
46	0.92655	0.92264	0.91870	81	0.84534	0.84101	0.83660
47	0.92441	0.92047	0.91650	82	0.84286	0.83852	0.83410
48	0.92225	0.91828	0.91429	83	0.84037	0.83602	0.83159
49	0.92006	0.91608	0.91207	84	0.83786	0.83350	0.82906
50	0.91787	0.91386	0.90983	85	0.83534	0.83097	0.82652
51	0.91566	0.91164	0.90758	86	0.83279	0.82842	0.82396
52	0.91344	0.90940	0.90533	87	0.83022	0.82583	0.82137
53	0.91120	0.90715	0.90307	88	0.82762	0.82323	0.81876
54	0.90895	0.90488	0.90079	89	0.82500	0.82060	0.81613
55	0.90670	0.90262	0.89851	90	0.82235	0.81795	0.81348
56	0.90443	0.90034	0.89622	91	0.81966	0.81527	0.81080
57	0.90215	0.89805	0.89392	92	0.81694	0.81255	0.80809
58	0.89987	0.89576	0.89162	93	0.81418	0.80979	0.80534
59	0.89758	0.89346	0.88931	94	0.81138	0.80700	0.80256
60	0.89528	0.89115	0.88700	95	0.80854	0.80417	0.79974
61	0.89297	0.88883	0.88467	96	0.80564	0.80129	0.79689
62	0.89066	0.88651	0.88234	97	0.80271	0.79838	0.79400
63	0.88834	0.88418	0.88000	98	0.79972	0.79541	0.79106
64	0.88601	0.88185	0.87766	99	0.79668	0.79240	0.78809
				100	0.79358	0.78933	0.78507

* $D\frac{15}{4}$ = density at 15° C. referred to water at 4° C.

LVI. — Density of Mixtures of Ethyl Alcohol and Water at $\frac{20°}{4°}$ C.

Per Cent Alcohol by Weight.	Tenths of Per Cent.									
	0	1	2	3	4	5	6	7	8	9
0	0.99824	804	786	767	748	729	710	692	673	654
1	0.99636	617	599	580	562	544	525	507	489	471
2	0.99453	434	417	399	381	363	345	327	310	292
3	0.99274	257	240	222	205	188	171	154	136	119
4	0.99102	086	069	052	035	019	002	*986	*969	*952
5	0.98936	920	904	887	871	855	839	823	807	791
6	0.98776	760	744	729	713	697	682	666	651	636
7	0.98620	605	590	575	560	545	530	515	500	485
8	0.98470	456	441	426	412	397	383	368	354	340
9	0.98325	311	297	283	269	255	241	227	213	199
10	0.98185	171	157	143	130	116	102	088	074	061
11	0.98047	034	020	006	*993	*979	*966	*953	*939	*926
12	0.97913	899	886	873	860	846	833	820	807	794
13	0.97781	768	755	742	728	715	702	689	676	663
14	0.97651	638	625	612	599	586	573	560	547	535
15	0.97522	509	496	483	470	457	444	432	419	406
16	0.97393	380	367	354	341	328	316	303	290	277
17	0.97264	251	238	225	212	199	186	173	160	147
18	0.97134	121	108	095	082	068	055	042	029	016
19	0.97003	*989	*976	*963	*950	*936	*923	*910	*896	*883
20	0.96870	856	843	830	816	803	790	776	763	749
21	0.96736	722	708	695	681	668	654	640	626	613
22	0.96599	585	571	557	544	530	516	502	488	473
23	0.96459	445	431	417	403	388	374	360	346	331
24	0.96317	302	288	273	259	244	230	215	200	186
25	0.96171	156	141	126	111	096	081	066	051	036
26	0.96021	006	*991	*975	*960	*945	*929	*914	*899	*883
27	0.95868	852	837	821	806	790	774	759	743	727
28	0.95711	695	679	663	647	631	615	599	583	566
29	0.95550	534	518	501	485	468	452	435	419	402

* The asterisk indicates a diminution of one in the second place decimal.

Per Cent Alcohol by Weight.	Tenths of Per Cent.									
	0	1	2	3	4	5	6	7	8	9
30	0.95385	369	352	335	318	301	284	267	250	232
31	0.95215	198	181	164	146	129	112	094	077	059
32	0.95042	024	007	*989	*971	*954	*936	*918	*900	*883
33	0.94865	847	829	811	793	775	757	739	720	702
34	0.94684	666	647	629	611	592	574	555	537	518
35	0.94499	481	462	443	424	406	386	368	349	330
36	0.94311	292	272	253	234	215	196	176	157	138
37	0.94119	099	080	061	041	022	002	*983	*963	*944
38	0.93924	904	884	864	845	825	805	785	765	745
39	0.93725	705	685	665	645	625	605	585	565	545
40	0.93524	504	484	464	443	423	402	382	362	341
41	0.93320	300	279	259	238	217	196	176	155	134
42	0.93113	092	072	051	030	009	*988	*967	*946	*925
43	0.92904	883	862	841	820	799	778	757	736	714
44	0.92693	672	651	629	608	587	566	544	523	501
45	0.92480	458	437	415	394	372	351	329	308	286
46	0.92264	243	221	199	178	156	134	112	091	069
47	0.92047	025	004	*982	*960	*938	*916	*894	*872	*850
48	0.91828	806	784	762	740	718	696	674	652	630
49	0.91608	586	564	542	519	497	475	453	431	408
50	0.91386	364	342	319	297	275	253	230	208	186
51	0.91164	141	119	096	074	052	029	007	*984	*962
52	0.90940	917	895	872	850	827	805	782	760	737
53	0.90715	692	670	647	624	602	579	556	534	511
54	0.90488	466	443	420	398	375	352	330	307	284
55	0.90262	239	216	193	170	148	125	102	079	056
56	0.90034	011	*988	*965	*942	*919	*896	*874	*851	*828
57	0.89805	782	759	736	713	690	668	645	622	599
58	0.89576	553	530	507	484	461	438	415	392	369
59	0.89346	323	300	277	254	230	207	184	161	138
60	0.89115	092	069	046	022	*999	*976	*953	*930	*906
61	0.88883	860	837	814	791	767	744	721	698	674
62	0.88651	628	605	581	558	535	512	488	465	442
63	0.88418	395	372	348	325	302	278	255	231	208
64	0.88185	161	138	114	091	068	044	021	*997	*974

* The asterisk indicates a diminution of one in the second place decimal.

Per Cent Alcohol by Weight.	Tenths of Per Cent.									
	0	1	2	3	4	5	6	7	8	9
65	0.87950	927	904	880	857	833	810	786	763	739
66	0.87716	692	669	645	622	598	574	551	527	504
67	0.87480	457	433	409	386	362	339	315	291	268
68	0.87244	221	197	173	150	126	102	079	055	031
69	0.87008	*984	*960	*936	*913	*889	*865	*842	*818	*794
70	0.86770	746	722	699	675	651	627	603	580	556
71	0.86532	508	484	460	436	412	388	364	340	316
72	0.86292	268	245	221	197	173	149	125	101	076
73	0.86052	028	004	*980	*956	*932	*908	*884	*860	*836
74	0.85812	788	764	739	715	691	667	643	618	594
75	0.85570	546	522	497	473	449	425	400	376	352
76	0.85328	303	279	255	230	206	182	157	133	109
77	0.85084	060	036	011	*987	*962	*938	*914	*889	*865
78	0.84840	816	791	767	742	718	693	669	644	620
79	0.84595	571	546	521	497	472	448	423	398	374
80	0.84349	324	299	275	250	225	200	176	151	126
81	0.84101	076	051	026	002	*977	*952	*927	*902	*877
82	0.83852	827	802	777	752	727	702	677	652	627
83	0.83602	577	552	526	501	476	451	426	401	376
84	0.83350	325	300	274	249	224	198	173	147	122
85	0.83097	071	046	020	*995	*969	*944	*918	*893	*867
86	0.82842	816	790	764	738	713	687	661	635	609
87	0.82583	557	531	506	479	453	427	401	375	349
88	0.82323	297	270	244	218	192	165	139	113	086
89	0.82060	034	007	*981	*954	*928	*901	*875	*848	*822
90	0.81795	768	742	715	688	661	634	608	581	554
91	0.81527	500	473	446	418	391	364	337	310	282
92	0.81255	228	200	173	145	118	090	062	035	007
93	0.80979	952	924	896	868	840	812	784	756	728
94	0.80700	672	644	616	587	559	531	502	474	445
95	0.80417	388	360	331	302	274	245	216	187	158
96	0.80129	100	071	042	013	*984	*955	*926	*896	*867
97	0.79838	808	779	749	720	690	660	631	601	571
98	0.79541	511	481	451	421	391	361	331	300	270
99	0.79240	209	179	148	118	087	056	026	*995	*964
100	0.78933									

* The asterisk indicates a diminution of one in the second place decimal.

LVII. — Specific Gravity of Mixtures of Ethyl Alcohol and Water at $\frac{60°}{60°}$ F. $\left(\frac{15.55°}{15.56°}\text{ C.}\right)$

Per Cent Alcohol by Volume at 60° F.	Tenths of Per Cent.									
	0	1	2	3	4	5	6	7	8	9
0	1.00000	*985	*970	*954	*940	*924	*910	*894	*880	*865
1	.99850	835	820	805	791	776	761	747	732	718
2	.99703	688	674	660	645	631	616	602	588	574
3	.99560	545	531	517	503	489	475	461	447	433
4	.99419	405	392	378	364	350	337	323	310	296
5	.99283	269	256	243	230	216	203	190	177	164
6	.99150	137	124	111	098	086	073	060	047	034
7	.99022	009	*996	*984	*971	*959	*946	*934	*922	*909
8	.98897	885	872	860	848	836	824	812	800	788
9	.98776	764	752	740	728	716	705	693	681	670
10	.98658	646	635	623	612	600	589	578	566	555
11	.98544	532	521	510	499	488	477	466	454	444
12	.98432	422	410	400	389	378	367	356	345	334
13	.98324	313	302	291	281	270	259	249	238	227
14	.98217	206	196	185	175	164	154	144	133	123
15	.98112	102	092	082	071	061	051	040	030	020
16	.98010	000	*989	*979	*969	*959	*949	*939	*928	*918
17	.97908	898	888	878	868	858	848	838	828	818
18	.97808	798	788	778	768	758	748	738	728	718
19	.97708	698	688	678	668	658	648	637	627	617
20	.97607	597	587	577	567	557	547	537	527	517
21	.97507	497	487	477	466	456	446	436	426	416
22	.97406	396	386	375	365	355	345	334	324	314
23	.97304	294	283	273	263	252	242	232	221	211
24	.97200	190	180	169	159	148	138	127	117	106
25	.97096	085	074	064	053	043	032	022	011	000
26	.96990	979	968	957	946	936	925	914	903	892
27	.96881	870	859	848	837	826	815	804	792	781
28	.96770	759	748	736	725	714	702	691	679	668
29	.96656	645	633	622	610	599	587	575	564	552

* The asterisk indicates a diminution of one in the second place decimal.

Per Cent Alcohol by Volume at 60° F.	Tenths of Per Cent.									
	0	1	2	3	4	5	6	7	8	9
30	.96540	528	516	504	492	481	469	456	444	432
31	.96420	408	396	384	372	359	347	335	322	310
32	.96297	285	272	260	248	235	222	210	197	184
33	.96172	159	146	133	120	107	094	082	068	055
34	.96042	029	016	003	*990	*976	*963	*950	*936	*923
35	.95909	896	882	868	855	841	827	814	800	786
36	.95772	758	744	730	716	702	688	673	659	645
37	.95630	616	602	587	573	558	544	529	515	500
38	.95485	471	456	441	426	412	397	382	367	352
39	.95337	322	306	291	276	261	246	230	215	200
40	.95184	168	153	137	122	106	090	075	059	043
41	.95027	011	*995	*979	*963	*947	*931	*915	*899	*883
42	.94866	850	834	817	801	784	768	751	735	718
43	.94702	685	668	651	634	618	601	584	567	550
44	.94532	515	498	481	464	447	429	412	395	377
45	.94360	342	325	307	290	272	254	236	219	201
46	.94183	165	147	129	111	093	076	058	039	021
47	.94003	*985	*967	*948	*930	*912	*893	*875	*856	*838
48	.93819	801	782	764	745	726	707	688	670	651
49	.93632	613	594	575	556	536	517	498	479	460
50	.93440	421	402	382	363	343	324	304	285	265
51	.93246	226	206	187	167	147	128	108	088	068
52	.93048	028	008	*988	*968	*948	*928	*908	*887	*867
53	.92847	827	806	786	766	745	725	704	684	663
54	.92643	622	601	581	560	539	518	498	477	456
55	.92435	414	393	372	351	330	309	288	267	246
56	.92224	203	182	161	139	118	097	075	054	032
57	.92011	*990	*968	*946	*925	*903	*882	*860	*838	*817
58	.91795	773	752	730	708	686	664	643	621	599
59	.91577	555	533	511	489	467	444	422	400	378
60	.91356	333	311	289	266	244	222	199	177	154
61	.91132	109	087	064	041	019	*996	*973	*951	*928
62	.90905	882	860	837	814	791	768	745	722	699
63	.90676	653	630	607	584	560	537	514	491	468
64	.90444	421	398	374	351	328	304	281	257	234

* The asterisk indicates a diminution of one in the second place decimal.

Per Cent Alcohol by Volume at 60° F.	Tenths of Per Cent.									
	0	1	2	3	4	5	6	7	8	9
65	.90210	187	163	140	116	092	069	045	022	*998
66	.89974	950	927	903	879	855	831	807	783	759
67	.89735	711	687	663	639	615	591	567	542	518
68	.89494	470	445	421	397	372	348	324	299	275
69	.89250	226	201	177	152	127	103	078	053	029
70	.89004	*979	*954	*930	*905	*880	*855	*830	*805	*780
71	.88755	730	705	680	655	630	605	580	554	529
72	.88504	478	453	428	403	377	352	326	301	276
73	.88250	224	199	173	147	122	096	070	044	018
74	.87993	967	941	915	889	864	838	812	786	760
75	.87734	708	682	655	629	603	577	550	524	498
76	.87471	445	419	392	366	339	313	286	259	233
77	.87206	179	153	126	099	072	045	018	*991	*964
78	.86937	910	883	856	829	802	774	747	720	692
79	.86665	638	610	583	555	528	500	472	445	417
80	.86389	362	334	306	278	250	222	194	166	138
81	.86110	082	054	025	*997	*969	*941	*912	*884	*855
82	.85827	799	770	742	713	684	656	627	598	570
83	.85541	512	483	454	425	396	367	338	308	279
84	.85250	220	191	162	132	103	073	044	014	*984
85	.84955	925	895	865	835	805	775	745	714	684
86	.84654	624	593	563	532	502	471	440	410	379
87	.84348	317	286	255	224	193	162	131	100	068
88	.84037	005	*974	*942	*910	*879	*847	*815	*783	*751
89	.83719	687	654	622	590	557	525	492	459	427
90	.83394	361	328	294	261	228	194	160	127	093
91	.83059	025	*991	*957	*923	*888	*854	*819	*785	*750
92	.82715	680	645	610	574	539	503	468	432	396
93	.82360	324	288	252	215	178	142	105	068	031
94	.81994	956	918	881	843	804	766	728	689	650
95	.81611	572	533	494	454	414	374	334	293	253
96	.81212	171	130	089	047	006	*964	*921	*879	*836
97	.80794	751	708	664	620	576	532	488	443	398
98	.80353	308	262	216	169	123	076	028	*981	*933
99	.79885	837	788	739	690	640	590	540	489	438
100	.79387									

* The asterisk indicates a diminution of one in the second place decimal.

TABLE LVIII. — PER CENTS OF ALCOHOL BY VOLUME AT 60° F., CORRESPONDING TO VARIOUS PER CENTS BY WEIGHT IN MIXTURES OF ETHYL ALCOHOL AND WATER

Per Cent Alcohol by Weight.	Tenths of Per Cent.									
	0	1	2	3	4	5	6	7	8	9
0	0.00	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.01	1.13
1	1.26	1.38	1.51	1.63	1.76	1.88	2.01	2.13	2.26	2.38
2	2.51	2.63	2.76	2.88	3.01	3.13	3.26	3.38	3.51	3.63
3	3.76	3.88	4.01	4.13	4.26	4.38	4.50	4.63	4.75	4.88
4	5.00	5.13	5.25	5.37	5.50	5.62	5.75	5.87	5.99	6.12
5	6.24	6.37	6.49	6.61	6.74	6.86	6.98	7.11	7.23	7.36
6	7.48	7.60	7.73	7.85	7.97	8.10	8.22	8.34	8.47	8.59
7	8.71	8.84	8.96	9.08	9.20	9.33	9.45	9.57	9.70	9.82
8	9.94	10.07	10.19	10.31	10.43	10.56	10.68	10.80	10.92	11.05
9	11.17	11.29	11.41	11.54	11.66	11.78	11.90	12.03	12.15	12.27
10	12.39	12.52	12.64	12.76	12.88	13.00	13.13	13.25	13.37	13.49
11	13.62	13.74	13.86	13.98	14.10	14.22	14.35	14.47	14.59	14.71
12	14.83	14.95	15.08	15.20	15.32	15.44	15.56	15.68	15.81	15.93
13	16.05	16.17	16.29	16.41	16.53	16.66	16.78	16.90	17.02	17.14
14	17.26	17.38	17.50	17.62	17.75	17.87	17.99	18.11	18.23	18.35
15	18.47	18.59	18.71	18.83	18.95	19.08	19.20	19.32	19.44	19.56
16	19.68	19.80	19.92	20.04	20.16	20.28	20.40	20.52	20.64	20.76
17	20.88	21.00	21.12	21.24	21.36	21.48	21.60	21.72	21.84	21.96
18	22.08	22.20	22.32	22.44	22.56	22.68	22.80	22.92	23.04	23.16
19	23.28	23.40	23.52	23.64	23.76	23.88	24.00	24.12	24.24	24.36
20	24.48	24.59	24.71	24.83	24.95	25.07	25.19	25.31	25.43	25.55
21	25.67	25.78	25.90	26.02	26.14	26.26	26.38	26.50	26.62	26.73
22	26.85	26.97	27.09	27.21	27.33	27.44	27.56	27.68	27.80	27.92
23	28.04	28.15	28.27	28.39	28.51	28.62	28.74	28.86	28.98	29.10
24	29.21	29.33	29.45	29.57	29.68	29.80	29.92	30.03	30.15	30.27
25	30.39	30.50	30.62	30.74	30.85	30.97	31.09	31.21	31.32	31.44
26	31.56	31.67	31.79	31.91	32.02	32.14	32.26	32.37	32.49	32.60
27	32.72	32.84	32.95	33.07	33.18	33.30	33.42	33.53	33.65	33.76
28	33.88	34.00	34.11	34.23	34.34	34.46	34.57	34.69	34.80	34.92
29	35.03	35.15	35.26	35.38	35.49	35.61	35.72	35.84	35.95	36.07

Per Cent Alcohol by Weight.	Tenths of Per Cent. 0	1	2	3	4	5	6	7	8	9
30	36.18	36.30	36.41	36.52	36.64	36.75	36.87	36.98	37.10	37.21
31	37.32	37.44	37.55	37.67	37.78	37.89	38.01	38.12	38.23	38.35
32	38.46	38.58	38.69	38.80	38.91	39.03	39.14	39.25	39.37	39.48
33	39.59	39.71	39.82	39.93	40.04	40.16	40.27	40.38	40.49	40.61
34	40.72	40.83	40.94	41.05	41.17	41.28	41.39	41.50	41.61	41.72
35	41.84	41.95	42.06	42.17	42.28	42.39	42.50	42.62	42.73	42.84
36	42.95	43.06	43.17	43.28	43.39	43.50	43.61	43.72	43.83	43.94
37	44.06	44.16	44.27	44.38	44.49	44.60	44.71	44.82	44.93	45.04
38	45.15	45.26	45.37	45.48	45.59	45.70	45.81	45.92	46.03	46.14
39	46.25	46.36	46.46	46.57	46.68	46.79	46.90	47.01	47.12	47.23
40	47.33	47.44	47.55	47.66	47.77	47.87	47.98	48.09	48.20	48.31
41	48.41	48.52	48.63	48.74	48.84	48.95	49.06	49.17	49.27	49.38
42	49.49	49.59	49.70	49.81	49.91	50.02	50.13	50.23	50.34	50.45
43	50.55	50.66	50.77	50.87	50.98	51.08	51.19	51.30	51.40	51.51
44	51.61	51.72	51.82	51.93	52.04	52.14	52.25	52.35	52.46	52.56
45	52.67	52.77	52.88	52.98	53.09	53.19	53.30	53.40	53.51	53.61
46	53.72	53.82	53.92	54.03	54.13	54.24	54.34	54.44	54.55	54.65
47	54.76	54.86	54.96	55.07	55.17	55.27	55.38	55.48	55.58	55.69
48	55.79	55.89	55.99	56.10	56.20	56.30	56.41	56.51	56.61	56.71
49	56.82	56.92	57.02	57.12	57.22	57.33	57.43	57.53	57.63	57.73
50	57.84	57.94	58.04	58.14	58.24	58.34	58.45	58.55	58.65	58.75
51	58.85	58.95	59.05	59.15	59.26	59.36	59.46	59.56	59.66	59.76
52	59.86	59.96	60.06	60.16	60.26	60.36	60.46	60.56	60.66	60.76
53	60.86	60.96	61.06	61.16	61.26	61.36	61.46	61.56	61.66	61.76
54	61.86	61.96	62.05	62.15	62.25	62.35	62.45	62.55	62.65	62.75
55	62.85	62.94	63.04	63.14	63.24	63.34	63.44	63.53	63.63	63.73
56	63.83	63.93	64.02	64.12	64.22	64.32	64.41	64.51	64.61	64.71
57	64.80	64.90	65.00	65.10	65.19	65.29	65.39	65.48	65.58	65.68
58	65.77	65.87	65.97	66.06	66.16	66.26	66.35	66.45	66.55	66.64
59	66.74	66.83	66.93	67.03	67.12	67.22	67.31	67.41	67.50	67.60
60	67.70	67.79	67.88	67.98	68.08	68.17	68.26	68.36	68.46	68.55
61	68.64	68.74	68.83	68.93	69.02	69.12	69.21	69.31	69.40	69.50
62	69.59	69.68	69.78	69.87	69.97	70.06	70.15	70.25	70.34	70.43
63	70.53	70.62	70.71	70.81	70.90	70.99	71.09	71.18	71.27	71.37
64	71.46	71.55	71.64	71.74	71.83	71.92	72.02	72.11	72.20	72.29

Per Cent Alcohol by Weight.	Tenths of Per Cent.									
	0	1	2	3	4	5	6	7	8	9
65	72.38	72.48	72.57	72.66	72.75	72.84	72.94	73.03	73.12	73.21
66	73.30	73.40	73.49	73.58	73.67	73.76	73.85	73.94	74.03	74.12
67	74.22	74.31	74.40	74.49	74.58	74.67	74.76	74.85	74.94	75.03
68	75.12	75.21	75.30	75.39	75.48	75.57	75.66	75.75	75.84	75.93
69	76.02	76.11	76.20	76.29	76.38	76.47	76.56	76.65	76.74	76.83
70	76.92	77.00	77.09	77.18	77.27	77.36	77.45	77.54	77.62	77.71
71	77.80	77.89	77.98	78.06	78.15	78.24	78.33	78.42	78.50	78.59
72	78.68	78.77	78.85	78.94	79.03	79.12	79.20	79.29	79.38	79.47
73	79.55	79.64	79.73	79.81	79.90	79.99	80.07	80.16	80.25	80.33
74	80.42	80.50	80.59	80.68	80.76	80.85	80.93	81.02	81.11	81.19
75	81.28	81.36	81.45	81.53	81.62	81.70	81.79	81.87	81.96	82.04
76	82.13	82.21	82.30	82.38	82.47	82.55	82.64	82.72	82.81	82.89
77	82.98	83.06	83.14	83.23	83.31	83.40	83.48	83.56	83.65	83.73
78	83.81	83.90	83.98	84.06	84.15	84.23	84.31	84.40	84.48	84.56
79	84.64	84.73	84.81	84.89	84.98	85.06	85.14	85.22	85.30	85.39
80	85.47	85.55	85.63	85.71	85.80	85.88	85.96	86.04	86.12	86.20
81	86.29	86.37	86.45	86.53	86.61	86.69	86.77	86.85	86.93	87.01
82	87.10	87.18	87.26	87.34	87.42	87.50	87.58	87.66	87.74	87.82
83	87.90	87.98	88.05	88.13	88.21	88.29	88.37	88.45	88.53	88.61
84	88.69	88.77	88.85	88.92	89.00	89.08	89.16	89.24	89.32	89.40
85	89.47	89.55	89.63	89.71	89.78	89.86	89.94	90.02	90.10	90.17
86	90.25	90.33	90.40	90.48	90.56	90.63	90.71	90.79	90.86	90.94
87	91.02	91.09	91.17	91.25	91.32	91.40	91.47	91.55	91.62	91.70
88	91.78	91.85	91.93	92.00	92.08	92.15	92.22	92.30	92.37	92.45
89	92.52	92.60	92.67	92.75	92.82	92.89	92.97	93.04	93.12	93.19
90	93.26	93.34	93.41	93.48	93.55	93.63	93.70	93.77	93.85	93.92
91	93.99	94.06	94.14	94.21	94.28	94.35	94.42	94.49	94.57	94.64
92	94.71	94.78	94.85	94.92	94.99	95.06	95.13	95.20	95.27	95.34
93	95.42	95.48	95.55	95.62	95.69	95.76	95.83	95.90	95.97	96.04
94	96.11	96.18	96.25	96.31	96.38	96.45	96.52	96.59	96.65	96.72
95	96.79	96.86	96.92	96.99	97.06	97.13	97.19	97.26	97.33	97.39
96	97.46	97.53	97.59	97.66	97.72	97.79	97.85	97.92	97.98	98.05
97	98.12	98.18	98.24	98.31	98.37	98.44	98.50	98.57	98.63	96.69
98	98.76	98.82	98.88	98.95	99.01	99.07	99.14	99.20	99.26	99.32
99	99.39	99.45	99.51	99.57	99.63	99.69	99.75	99.82	99.88	99.94
100	100.00									

LIX. — Reduction of Mixtures of Ethyl Alcohol and Water from Per Cents by Volume to Per Cents by Weight

Per Cent Alcohol by Volume at 60° F.	Per Cent Alcohol by Weight.	Differences.	Per Cent Alcohol by Volume at 60° F.	Per Cent Alcohol by Weight.	Differences.	Per Cent Alcohol by Volume at 60° F.	Per Cent Alcohol by Weight.	Differences.
0	0.00	0.80	23	18.76	0.84	46	38.78	0.91
1	0.80	0.79	24	19.60	0.84	47	39.69	0.93
2	1.59	0.80	25	20.44	0.84	48	40.62	0.92
3	2.39	0.81	26	21.28	0.84	49	41.54	0.94
4	3.20	0.80	27	22.12	0.85	50	42.48	0.94
5	4.00	0.80	28	22.97	0.85	51	43.42	0.95
6	4.80	0.81	29	23.82	0.85	52	44.37	0.95
7	5.61	0.81	30	24.67	0.85	53	45.32	0.95
8	6.42	0.81	31	25.52	0.86	54	46.27	0.97
9	7.23	0.82	32	26.38	0.86	55	47.24	0.96
10	8.05	0.81	33	27.24	0.86	56	48.20	0.98
11	8.86	0.82	34	28.10	0.87	57	49.18	0.98
12	9.68	0.82	35	28.97	0.87	58	50.16	0.99
13	10.50	0.82	36	29.84	0.88	59	51.15	0.99
14	11.32	0.82	37	30.72	0.87	60	52.14	1.00
15	12.14	0.82	38	31.59	0.89	61	53.14	1.00
16	12.96	0.82	39	32.48	0.88	62	54.14	1.02
17	13.78	0.83	40	33.36	0.89	63	55.16	1.02
18	14.61	0.83	41	34.25	0.90	64	56.18	1.02
19	15.44	0.83	42	35.15	0.89	65	57.20	1.03
20	16.27	0.83	43	36.04	0.91	66	58.23	1.04
21	17.10	0.83	44	36.95	0.91	67	59.27	1.05
22	17.93	0.83	45	37.86	0.92	68	60.32	1.06

Per Cent Alcohol by Volume at 60° F.	Per cent Alcohol by Weight.	Differences.	Per Cent Alcohol by Volume at 60° F.	Per Cent Alcohol by Weight.	Differences.	Per Cent Alcohol by Volume at 60° F.	Per Cent Alcohol by Weight.	Differences.
69	61.38	1.06	80	73.52	1.16	91	86.98	1.32
70	62.44	1.07	81	74.68	1.17	92	88.30	1.34
71	63.51	1.07	82	75.85	1.18	93	89.64	1.37
72	64.58	1.09	83	77.03	1.19	94	91.01	1.40
73	65.67	1.09	84	78.22	1.21	95	92.41	1.43
74	66.76	1.10	85	79.43	1.22	96	93.84	1.47
75	67.86	1.12	86	80.65	1.23	97	95.31	1.51
76	68.98	1.12	87	81.88	1.25	98	96.82	1.56
77	70.10	1.13	88	83.13	1.27	99	98.38	1.62
78	71.23	1.14	89	84.40	1.28	100	100.00	
79	72.37	1.15	90	85.68	1.30			

LX. — Methyl Alcohol at $\frac{15.56°}{4°}$

Dittmar and Fawsitt

Specific Gravity.	Per Cent by Weight.	Specific Gravity.	Per Cent by Weight.	Specific Gravity.	Per Cent by Weight.	Specific Gravity.	Per Cent by Weight.
0.99729	1	0.94055	38	0.89133	63	0.84521	82
0.99554	2	0.93697	40	0.88905	64	0.84262	83
0.99214	4	0.93335	42	0.88676	65	0.84001	84
0.98893	6	0.92975	44	0.88443	66	0.83738	85
0.98569	8	0.92610	46	0.88208	67	0.83473	86
0.98262	10	0.92237	48	0.87970	68	0.83207	87
0.97962	12	0.91855	50	0.87714	69	0.82938	88
0.97668	14	0.91661	51	0.87487	70	0.82668	89
0.97379	16	0.91465	52	0.87262	71	0.83396	90
0.97039	18	0.91267	53	0.87021	72	0.82123	91
0.96808	20	0.91066	54	0.86779	73	0.81849	92
0.96524	22	0.90863	55	0.86535	74	0.81572	93
0.96238	24	0.90657	56	0.86290	75	0.81293	94
0.95947	26	0.90450	57	0.86042	76	0.81013	95
0.95655	28	0.90239	58	0.85793	77	0.80731	96
0.95355	30	0.90026	59	0.85542	78	0.80448	97
0.95053	32	0.89798	60	0.85290	79	0.80164	98
0.94732	34	0.89580	61	0.85035	80	0.79876	99
0.94399	36	0.89358	62	0.84779	81	0.79589	100

LXI. — Specific Gravity and Percentage by Weight and Volume of Methyl Alcohol

Techn. Hogskolan Stockholm. Arkiv. Kemi. Min. Geol. (2) 27, 32 pp.

Specific Gravity $\frac{15.6^\circ}{15.6^\circ}$ C.	Per Cent Weight.	Per Cent Volume.	Specific Gravity $\frac{15.6^\circ}{15.6^\circ}$ C.	Per Cent Weight.	Per Cent Volume.	Specific Gravity $\frac{15.6^\circ}{15.6^\circ}$ C.	Per Cent Weight.	Per Cent Volume.
1.0000	0.00	0.00	0.9962	2.04	2.62	0.9924	4.24	5.38
0.9999	0.06	0.07	0.9961	2.09	2.69	0.9923	4.29	5.45
0.9998	0.11	0.13	0.9960	2.14	2.76	0.9922	4.35	5.52
0.9997	0.17	0.20	0.9959	2.20	2.83	0.9921	4.41	5.60
0.9996	0.22	0.27	0.9958	2.26	2.90	0.9920	4.57	5.67
0.9995	0.28	0.33	0.9957	2.31	2.98	0.9919	4.53	5.74
0.9994	0.33	0.40	0.9956	2.37	3.05	0.9918	4.60	5.82
0.9993	0.39	0.47	0.9955	2.43	3.12	0.9917	4.66	5.89
0.9992	0.44	0.53	0.9954	2.49	3.19	0.9916	4.72	5.96
0.9991	0.50	0.60	0.9953	2.55	3.26	0.9915	4.78	6.04
0.9990	0.55	0.67	0.9952	2.60	3.34	0.9914	4.85	6.11
0.9989	0.61	0.73	0.9951	2.66	3.41	0.9913	4.91	6.18
0.9988	0.66	0.80	0.9950	2.72	3.48	0.9912	4.97	6.25
0.9987	0.72	0.86	0.9949	2.78	3.55	0.9911	5.03	6.33
0.9986	0.77	0.93	0.9948	2.84	3.62	0.9910	5.10	6.40
0.9985	0.83	1.00	0.9947	2.89	3.70	0.9909	5.16	6.47
0.9984	0.88	1.06	0.9946	2.95	3.77	0.9908	5.22	6.55
0.9983	0.94	1.13	0.9945	3.01	3.84	0.9907	5.28	6.62
0.9982	0.99	1.20	0.9944	3.07	3.91	0.9906	5.35	6.69
0.9981	1.05	1.26	0.9943	3.13	3.98	0.9905	5.41	6.77
0.9980	1.10	1.33	0.9942	3.18	4.06	0.9904	5.47	6.84
0.9979	1.15	1.40	0.9941	3.24	4.13	0.9903	5.53	6.91
0.9978	1.20	1.47	0.9940	3.30	4.20	0.9902	5.60	6.98
0.9977	1.26	1.54	0.9939	3.36	4.27	0.9901	5.66	7.06
0.9976	1.31	1.62	0.9938	3.42	4.35	0.9900	5.72	7.13
0.9975	1.36	1.69	0.9937	3.48	4.42	0.9899	5.78	7.21
0.9974	1.41	1.76	0.9936	3.53	4.49	0.9898	5.85	7.28
0.9973	1.46	1.83	0.9935	3.59	4.57	0.9897	5.91	7.36
0.9972	1.52	1.90	0.9934	3.65	4.64	0.9896	5.97	7.44
0.9971	1.57	1.97	0.9933	3.71	4.71	0.9895	6.04	7.52
0.9970	1.62	2.05	0.9932	3.77	4.79	0.9894	6.10	7.59
0.9969	1.67	2.12	0.9931	3.83	4.89	0.9893	6.16	7.67
0.9968	1.72	2.19	0.9930	3.89	4.94	0.9892	6.23	7.75
0.9967	1.78	2.26	0.9929	3.94	5.01	0.9891	6.29	7.82
0.9966	1.83	2.33	0.9928	4.00	5.08	0.9890	6.36	7.90
0.9965	1.88	2.40	0.9927	4.06	5.16	0.9889	6.42	7.98
0.9964	1.93	2.47	0.9926	4.12	5.23	0.9888	6.48	8.05
0.9963	1.98	2.55	0.9925	4.18	5.30	0.9887	6.55	8.13

Specific Gravity $\frac{15.6°}{15.6°}$ C.	Per Cent Weight.	Per Cent Volume.	Specific Gravity $\frac{15.6°}{15.6°}$ C.	Per Cent Weight.	Per Cent Volume.	Specific Gravity $\frac{15.6°}{15.6°}$ C.	Per Cent Weight.	Per Cent Volume.
0.9886	6.61	8.21	0.9843	9.39	11.58	0.9800	12.27	15.12
0.9885	6.67	8.29	0.9842	9.45	11.66	0.9799	12.34	15.21
0.9884	6.74	8.36	0.9841	9.52	11.74	0.9798	12.41	15.29
0.9883	6.80	8.44	0.9840	9.58	11.82	0.9797	12.48	15.38
0.9882	6.86	8.52	0.9839	9.65	11.90	0.9796	12.55	15.46
0.9881	6.93	8.59	0.9838	9.72	11.98	0.9795	12.62	15.55
0.9880	6.99	8.67	0.9837	9.78	12.06	0.9794	12.69	15.63
0.9879	7.06	8.75	0.9836	9.85	12.14	0.9793	12.76	15.72
0.9878	7.12	8.83	0.9835	9.92	12.23	0.9792	12.83	15.80
0.9877	7.19	8.90	0.9834	9.99	12.31	0.9791	12.90	15.89
0.9876	7.25	8.98	0.9833	10.06	12.39	0.9790	12.97	15.87
0.9875	7.32	9.06	0.9832	10.12	12.47	0.9789	13.04	16.06
0.9874	7.38	9.14	0.9831	10.19	12.55	0.9788	13.11	16.14
0.9873	7.45	9.22	0.9830	10.26	12.63	0.9787	13.18	16.23
0.9872	7.51	9.29	0.9829	10.33	12.71	0.9786	13.25	16.31
0.9871	7.58	9.37	0.9828	10.40	12.79	0.9785	13.32	16.40
0.9870	7.64	9.45	0.9827	10.46	12.87	0.9784	13.39	16.48
0.9869	7.71	9.53	0.9826	10.53	12.95	0.9783	13.46	16.57
0.9868	7.77	9.61	0.9825	10.60	13.04	0.9782	13.53	16.65
0.9867	7.84	9.68	0.9824	10.67	13.12	0.9781	13.60	16.74
0.9866	7.90	9.76	0.9823	10.74	13.20	0.9780	13.67	16.82
0.9865	7.97	9.84	0.9822	10.80	13.28	0.9779	13.74	16.91
0.9864	8.03	9.92	0.9821	10.87	13.36	0.9778	13.82	16.99
0.9863	8.10	10.00	0.9820	10.94	13.44	0.9777	13.89	17.08
0.9862	8.16	10.07	0.9819	11.01	13.52	0.9776	13.96	17.16
0.9861	8.23	10.15	0.9818	11.07	13.61	0.9775	14.03	17.25
0.9860	8.29	10.23	0.9817	11.14	13.69	0.9774	14.11	17.33
0.9859	8.35	10.31	0.9816	11.21	13.78	0.9773	14.18	17.42
0.9858	8.42	10.38	0.9815	11.27	13.86	0.9772	14.25	17.50
0.9857	8.48	10.47	0.9814	11.34	13.94	0.9771	14.32	17.59
0.9856	8.55	10.55	0.9813	11.41	14.03	0.9770	14.40	17.68
0.9855	8.61	10.63	0.9812	11.47	14.11	0.9769	14.47	17.76
0.9854	8.68	10.71	0.9811	11.54	14.20	0.9768	14.54	17.85
0.9853	8.74	10.79	0.9810	11.61	14.28	0.9767	14.61	17.93
0.9852	8.81	10.87	0.9809	11.67	14.36	0.9766	14.69	18.02
0.9851	8.87	10.95	0.9808	11.74	14.45	0.9765	14.76	18.10
0.9850	8.94	11.03	0.9807	11.80	14.53	0.9764	14.83	18.19
0.9849	9.00	11.10	0.9806	11.87	14.62	0.9763	14.90	18.27
0.9848	9.06	11.18	0.9805	11.94	14.70	0.9762	14.98	18.36
0.9847	9.13	11.26	0.9804	12.00	14.78	0.9761	15.05	18.44
0.9846	9.19	11.34	0.9803	12.07	14.87	0.9760	15.12	18.53
0.9845	9.26	11.42	0.9802	12.14	14.95	0.9759	15.19	18.62
0.9844	9.32	11.50	0.9801	12.20	15.04	0.9758	15.27	18.70

Specific Gravity $\frac{15.6°}{15.6°}$ C.	Per Cent Weight.	Per cent Volume.	Specific Gravity $\frac{15.6°}{15.6°}$ C.	Per Cent Weight.	Per Cent Volume.	Specific Gravity $\frac{15.6°}{15.6°}$ C.	Per Cent Weight.	Per Cent Volume.
0.9757	15.34	18.79	0.9714	18.40	22.47	0.9671	21.42	26.10
0.9756	15.41	18.88	0.9713	18.47	22.56	0.9670	21.49	26.18
0.9755	15.49	18.96	0.9712	18.54	22.64	0.9669	21.56	26.26
0.9754	15.56	19.05	0.9711	18.61	22.73	0.9668	21.63	26.35
0.9753	15.63	19.14	0.9710	18.68	22.82	0.9667	21.70	26.43
0.9752	15.70	19.22	0.9709	18.75	22.90	0.9666	21.77	26.52
0.9751	15.78	19.31	0.9708	18.82	22.99	0.9665	21.84	26.60
0.9750	15.95	19.40	0.9707	18.89	23.07	0.9664	21.91	26.68
0.9749	15.92	19.48	0.9706	18.96	23.16	0.9663	21.98	26.77
0.9748	16.00	19.56	0.9705	19.03	23.24	0.9662	22.05	26.85
0.9747	16.07	19.65	0.9704	19.10	23.33	0.9661	22.12	26.94
0.9746	16.14	19.74	0.9703	19.17	23.41	0.9660	22.19	27.02
0.9745	16.22	19.83	0.9702	19.24	23.50	0.9659	22.26	27.10
0.9744	16.29	19.91	0.9701	19.31	23.58	0.9658	22.52	27.18
0.9743	16.36	20.00	0.9700	19.38	23.67	0.9657	22.40	27.26
0.9742	16.43	20.09	0.9699	19.45	23.75	0.9656	22.47	27.34
0.9741	16.51	20.17	0.9698	19.52	23.84	0.9655	22.54	27.43
0.9740	16.58	20.26	0.9697	19.59	23.92	0.9654	22.61	27.51
0.9739	16.65	20.35	0.9696	19.66	24.00	0.9653	22.68	27.59
0.9738	16.72	20.43	0.9695	19.73	24.09	0.9652	22.75	27.67
0.9737	16.79	20.52	0.9694	19.80	24.17	0.9651	22.82	27.75
0.9736	16.86	20.60	0.9693	19.87	24.25	0.9650	22.89	27.83
0.9735	16.93	20.69	0.9692	19.94	24.34	0.9649	22.96	27.91
0.9734	17.00	20.77	0.9691	20.01	24.42	0.9648	23.03	27.99
0.9733	17.07	20.86	0.9690	20.09	24.51	0.9647	23.10	28.07
0.9732	17.14	20.94	0.9689	20.16	24.59	0.9646	23.17	28.18
0.9731	17.21	21.03	0.9688	20.23	24.67	0.9645	23.24	28.24
0.9730	17.28	21.11	0.9687	20.30	24.76	0.9644	23.31	28.32
0.9729	17.35	21.20	0.9686	20.37	24.84	0.9643	23.38	28.40
0.9728	17.42	21.28	0.9685	20.44	24.92	0.9642	23.45	28.48
0.9727	17.49	21.37	0.9684	20.51	25.01	0.9641	23.52	28.56
0.9726	17.56	21.45	0.9683	20.58	25.09	0.9640	23.59	28.64
0.9725	17.63	21.54	0.9682	20.65	25.17	0.9639	23.66	28.72
0.9724	17.70	21.62	0.9681	20.72	25.26	0.9638	23.75	28.80
0.9723	17.77	27.71	0.9680	20.79	25.34	0.9637	23.80	28.88
0.9722	17.84	21.79	0.9679	20.86	25.42	0.9636	23.88	28.96
0.9721	17.81	21.88	0.9678	20.93	25.51	0.9635	23.95	29.04
0.9720	17.98	21.96	0.9677	21.00	25.59	0.9634	24.02	29.11
0.9719	18.05	22.05	0.9676	21.07	25.68	0.9633	24.09	29.19
0.9718	18.12	22.13	0.9675	21.14	25.76	0.9632	24.16	29.27
0.9717	18.19	22.22	0.9674	21.21	25.84	0.9631	24.23	29.36
0.9716	18.26	22.30	0.9673	21.28	25.95	0.9630	24.31	29.43
0.9715	18.33	22.39	0.9672	21.33	26.01	0.9629	24.38	29.51

LXII. — Refractometer Readings of Methyl and Ethyl Alcohol

ZEISS' IMMERSION REFRACTOMETER

By Leach and Lythgoe

Per Cent Alcohol by Weight.*	Scale Readings at 20° C.		Per Cent Alcohol by Weight.	Scale Readings at 20° C.		Per Cent Alcohol by Weight.	Scale Readings at 20° C.	
	Methyl Alcohol.	Ethyl Alcohol.		Methyl Alcohol.	Ethyl Alcohol.		Methyl Alcohol.	Ethyl Alcohol.
0	14.5	14.5	15.5	23.55	41.5	31	33.5	70.4
0.5	14.65	15.25	16	23.9	42.5	31.5	33.8	71.05
1	14.8	16.0	16.5	24.2	43.5	32	34.1	71.7
1.5	15.1	16.8	17	24.5	44.5	32.5	34.4	72.4
2	15.4	17.6	17.5	24.85	45.5	33	34.7	73.1
2.5	15.7	18.35	18	25.2	46.5	33.5	34.95	73.75
3	16.0	19.1	18.5	25.5	47.5	34	35.2	74.4
3.5	16.3	19.9	19	25.8	48.5	34.5	35.5	75.1
4	16.6	20.7	19.5	26.15	49.5	35	35.8	75.8
4.5	16.9	21.5	20	26.5	50.5	35.5	36.05	76.35
5	17.2	22.3	20.5	26.8	51.45	36	36.3	76.9
5.5	17.5	23.2	21	27.1	52.4	36.5	36.55	77.95
6	17.8	24.1	21.5	27.45	53.35	37	36.8	78.0
6.5	18.1	25.0	22	27.8	54.3	37.5	37.05	78.55
7	18.4	25.9	22.5	28.1	55.3	38	37.3	79.1
7.5	18.7	26.85	23	28.4	56.3	38.5	37.5	79.65
8	19.0	27.8	23.5	28.75	57.25	39	37.7	80.2
8.5	19.3	28.7	24	29.1	58.2	39.5	37.9	80.75
9	19.6	29.6	24.5	29.4	59.15	40	38.1	81.3
9.5	19.9	30.5	25	29.7	60.1	40.5	38.25	81.8
10	20.2	31.4	25.5	30.0	61.0	41	38.4	82.3
10.5	20.5	32.3	26	30.3	61.9	41.5	38.6	82.8
11	20.8	33.2	26.5	30.6	62.8	42	38.8	83.3
11.5	21.1	34.1	27	30.9	63.7	42.5	39.0	83.75
12	21.4	35.0	27.5	31.25	64.6	43	39.2	84.2
12.5	21.7	35.95	28	31.6	65.5	43.5	39.25	84.7
13	22.0	36.9	28.5	31.9	66.35	44	39.3	85.2
13.5	22.3	37.8	29	32.2	67.2	44.5	39.35	85.7
14	22.6	38.7	29.5	32.4	68.1	45	39.4	86.2
14.5	22.9	39.6	30	32.8	69.0	45.5	39.45	86.6
15	23.2	40.5	30.5	33.15	69.7	46	39.5	87.0

* Interpolated to half degrees.

Per Cent Alcohol by Weight. *	Scale Readings at 20° C.		Per Cent Alcohol by Weight.	Scale Readings at 20° C.		Per Cent Alcohol by Weight.	Scale Readings at 20° C.	
	Methyl Alcohol.	Ethyl Alcohol.		Methyl Alcohol.	Ethyl Alcohol.		Methyl Alcohol.	Ethyl Alcohol.
46.5	39.55	87.4	64.5	35.75	98.15	82.5	23.45	100.45
47	39.6	87.8	65	35.5	98.3	83	23.6	100.4
47.5	39.65	88.25	65.5	35.25	98.5	83.5	23.2	100.35
48	39.7	88.7	66	35.0	98.7	84	22.8	100.3
48.5	39.75	89.1	66.5	34.75	98.9	84.5	22.3	100.2
49	39.8	89.5	67	34.5	99.1	85	21.8	100.1
49.5	39.8	89.9	67.5	34.25	99.25	85.5	21.3	99.95
50	39.8	90.3	68	34.0	99.4	86	20.8	99.8
50.5	39.75	90.7	68.5	33.75	99.55	86.5	20.25	99.65
51	39.7	91.1	69	33.5	99.7	87	19.7	99.5
51.5	39.65	91.45	69.5	33.25	99.85	87.5	19.15	99.35
52	39.6	91.8	70	33.0	100.0	88	18.6	99.2
52.5	39.6	92.1	70.5	32.65	100.1	88.5	17.95	99.05
53	39.6	92.4	71	32.3	100.2	89	17.3	98.9
53.5	39.55	92.7	71.5	32.0	100.3	89.5	16.7	98.75
54	39.5	93.0	72	31.7	100.4	90	16.1	98.6
54.5	39.45	93.3	72.5	31.4	100.5	90.5	15.5	98.45
55	39.4	93.6	73	31.1	100.6	91	14.9	98.3
55.5	39.3	93.85	73.5	30.75	100.7	91.5	14.3	98.05
56	39.2	94.1	74	30.4	100.8	92	13.7	97.8
56.5	39.1	94.4	74.5	29.75	100.9	92.5	13.05	97.5
57	39.0	94.7	75	29.7	101.0	93	12.4	97.2
57.5	38.8	94.95	75.5	29.35	101.0	93.5	11.7	96.8
58	38.6	95.2	76	29.0	101.0	94	11.0	96.4
58.5	38.45	95.45	76.5	28.65	100.95	94.5	10.3	96.05
59	38.3	95.7	77	28.3	100.9	95	9.6	95.7
59.5	38.1	95.55	77.5	27.95	100.9	95.5	8.9	95.3
60	37.9	96.2	78	27.6	100.9	96	8.2	94.9
60.5	37.7	96.45	78.5	27.2	100.85	96.5	7.45	94.45
61	37.5	96.7	79	26.8	100.8	97	6.7	94.0
61.5	37.25	96.9	79.5	26.4	100.75	97.5	5.9	93.5
62	37.0	97.1	80	26.0	100.7	98	5.1	93.0
62.5	36.75	97.3	80.5	25.55	100.65	98.5	4.3	92.5
63	36.5	97.5	81	25.1	100.6	99	3.5	92.0
63.5	36.25	97.75	81.5	24.7	100.55	99.5	2.75	91.5
64	36.0	98.0	82	24.3	100.5	100	2.0	91.0

* Interpolated to half degrees.

CALCULATION OF THE AMOUNT OF ETHYL AND METHYL ALCOHOL IN DISTILLATES CONTAINING A MIXTURE OF THE TWO

By A. F. Seeker

EXAMPLE.

Observed data: — Specific gravity $\frac{15.6°}{15.6°}$, 0.9796.

Immersion refractometer reading 20°, 26.8.

The observed specific gravity corresponds to the following percentages of the respective alcohols having the refractometer readings indicated in the last column:

	Per cent by vol.	Per cent by wt.	Refractometer reading at 20°.
(1) Ethyl alcohol	16.50	13.37	37.57
(2) Methyl alcohol	15.46	12.55	21.73

The difference in refractometer reading for these percentages of the respective alcohols

$$(3)\quad 37.57 - 21.73 = 15.84$$

divided into the difference between the observed refractometer reading and the refractometer reading for ethyl alcohol alone

$$(4)\quad 37.57 - 26.8 = 10.77$$

gives the proportion of methyl alcohol in the mixture.

$$(5)\quad \frac{10.77}{15.84} = 0.68 \text{ methyl alcohol.}$$

$$(6)\quad 1.00 - 0.68 = 0.32 \text{ ethyl alcohol.}$$

Referring back to the possible content of each alcohol calculated from the specific gravity (1) and (2), and multiplying each by their respective proportional parts just found we have:

(7) 15.46 × 0.68 = 10.51
(8) 16.50 × 0.32 = 5.28

15.79 per cent by vol. of mixed alcohols in the distillate.

It has been found (5) that 0.68 of this is methyl alcohol and (6) 0.32 is ethyl alcohol; consequently:

(9) 15.79 × 0.68 = 10.74 per cent by vol. of the distillate is methyl and
(10) 15.79 × 0.32 = 5.05 per cent by vol. of the distillate is ethyl acohol.

Starting from (7) the percentages by weight can be found in the same way.

(11) 12.55 × 0.68 = 8.53
(12) 13.37 × 0.32 = 4.38

12.91 per cent by weight of mixed alcohols in the distillate.

(13) 12.91 × 0.68 = 8.78 per cent by weight of the distillate is methyl and
(14) 12.91 × 0.32 = 4.13 per cent by weight of the distillate is ethyl alcohol.

LXIII. — Specific Gravity Aqueous Solutions Chemically Pure Glycerene

Per Cent Glycerene.	Gerlach.		Skalweit.	Per Cent Glycerene.	Gerlach.		Skalweit.
	Sp. Gr. at 15° C. Water at 15° = 1.	Sp. Gr. at 20° C. Water at 20° = 1.	Sp. Gr. at 15° C.		Sp. Gr. at 15° C. Water at 15° = 1.	Sp. Gr. at 20° C. Water at 20° = 1.	Sp. Gr. at 15°.
0	1.0000	1.0000	1.0000	36			1.0912
1			1.0024	37			1.0939
2			1.0048	38			1.0966
3			1.0072	39			1.0993
4			1.0096	40	1.1020	1.1010	1.1020
5			1.0120	41			1.1047
6			1.0144	42			1.1074
7			1.0168	43			1.1101
8			1.0192	44			1.1128
9			1.0216	45	1.1155	1.1145	1.1155
10	1.0245	1.0235	1.0240	46			1.1182
11			1.0265	47			1.1209
12			1.0290	48			1.1236
13			1.0315	49			1.1263
14			1.0340	50	1.1294	1.1280	1.1290
15			1.0365	51			1.1318
16			1.0390	52			1.1346
17			1.0415	53			1.1374
18			1.0440	54			1.1402
19			1.0465	55	1.1430	1.1415	1.1430
20	1.0490	1.0480	1.0490	56			1.1458
21			1.0516	57			1.1486
22			1.0542	58			1.1514
23			1.0568	59			1.1542
24			1.0594	60	1.1570	1.1550	1.1570
25	1.0620	1.0610	1.0620	61			1.1599
26			1.0646	62			1.1628
27			1.0672	63			1.1657
28			1.0698	64			1.1686
29			1.0724	65	1.1711	1.1685	1.1715
30	1.0750	1.0740	1.0750	66			1.1743
31			1.0777	67			1.1771
32			1.0804	68			1.1799
33			1.0831	69			1.1827
34			1.0858	70	1.1850	1.1820	1.1855
35	1.0885	1.0875	1.0885	71	1.1878	1.1847	1.1882

Per Cent Glycerene.	Gerlach.		Skalweit.	Per Cent Glycerene.	Gerlach.		Skalweit.
	Sp. Gr. at 15° C. Water at 15° = 1.	Sp. Gr. at 20° C. Water at 20° = 1.	Sp. Gr. at 15°.		Sp. Gr. at 15° C. Water at 15° = 1.	Sp. Gr. at 20° C. Water at 20° = 1.	Sp. Gr. at 15°.
72	1.1906	1.1874	1.1909	87	1.2319	1.2279	1.2314
73	1.1934	1.1901	1.1936	88	1.2346	1.2306	1.2341
74	1.1962	1.1928	1.1963	89	1.2373	1.2333	1.2368
75	1.1990	1.1955	1.1990	90	1.2400	1.2360	1.2395
76	1.2018	1.1982	1.2017	91	1.2425	1.2386	1.2421
77	1.2046	1.2009	1.2044	92	1.2451	1.2412	1.2447
78	1.2074	1.2036	1.2071	93	1.2476	1.2438	1.2473
79	1.2102	1.2063	1.2098	94	1.2501	1.2464	1.2499
80	1.2130	1.2090	1.2125	95	1.2526	1.2490	1.2525
81	1.2157	1.2117	1.2152	96	1.2552	1.2516	1.2550
82	1.2184	1.2144	1.2179	97	1.2577	1.2542	1.2575
83	1.2211	1.2171	1.2206	98	1.2602	1.2568	1.2600
84	1.2238	1.2198	1.2233	99	1.2628	1.2594	1.2625
85	1.2265	1.2225	1.2260	100	1.2653	1.2620	1.2650
86	1.2292	1.2252	1.2287				

LXIV. — Ammonium Sulphate Solution at 19°

Schiff

Specific Gravity.	Per Cent $(NH_4)_2SO_4$.	Specific Gravity.	Per Cent $(NH_4)_2SO_4$.	Specific Gravity.	Per Cent $(NH_4)_2SO_4$.	Specific Gravity.	Per Cent $(NH_4)_2SO_4$.	Specific Gravity.	Per Cent $(NH_4)_2SO_4$.
1.0057	1	1.0632	11	1.1207	21	1.1780	31	1.2343	41
1.0115	2	1.0690	12	1.1265	22	1.1836	32	1.2402	42
1.0172	3	1.0747	13	1.1323	23	1.1892	33	1.2462	43
1.0230	4	1.0805	14	1.1381	24	1.1948	34	1.2522	44
1.0287	5	1.0862	15	1.1439	25	1.2004	35	1.2583	45
1.0345	6	1.0920	16	1.1496	26	1.2060	36	1.2644	46
1.0403	7	1.0977	17	1.1554	27	1.2116	37	1.2705	47
1.0460	8	1.1035	18	1.1612	28	1.2172	38	1.2766	48
1.0518	9	1.1092	19	1.1670	29	1.2228	39	1.2828	49
1.0575	10	1.1149	20	1.1724	30	1.2284	40	1.2890	50

LXV. — Ammonium Chloride Solution at 15°

Gerlach

Specific Gravity.	Per Cent NH_4Cl.	Specific Gravity.	Per Cent NH_4Cl.	Specific Gravity.	Per Cent NH_4Cl.	Specific Gravity.	Per Cent NH_4Cl.	Specific Gravity.	Per Cent NH_4Cl.
1.00316	1	1.02180	7	1.03947	13	1.05648	19	1.07304	25
1.00632	2	1.02481	8	1.04325	14	1.05929	20	1.07575	26
1.00948	3	1.02781	9	1.04524	15	1.06204	21	1.07658	26.297
1.01264	4	1.03081	10	1.04805	16	1.06479	22		
1.01580	5	1.03370	11	1.05086	17	1.06754	23		
1.01880	6	1.03658	12	1.05367	18	1.07029	24		

LXVI. — Available Chlorine in Bleaching Powder Solution at 15°

Lunge and Bachoffen

Specific Gravity.	Grams Cl per l.	Specific Gravity.	Grams Cl per l.	Specific Gravity.	Grams Cl per l.	Specific Gravity.	Grams Cl per l.
1.0000	traces	1.0300	17.36	1.0650	39.10	1.1000	61.50
1.0025	1.40	1.0350	20.44	1.0700	42.31	1.1050	64.50
1.0050	2.71	1.0400	23.75	1.0750	45.70	1.1060	65.33
1.0100	5.58	1.0450	26.62	1.0800	49.96	1.1100	68.00
1.0150	8.48	1.0500	29.60	1.0850	52.27	1.1105	68.40
1.0200	11.41	1.0550	32.68	1.0900	55.18	1.1150	71.50
1.0250	14.47	1.0600	35.81	1.0950	58.40	1.1155	71.79

LXVII. — Cupric Chloride Solution at 17.5°

Franz

Specific Gravity.	Per Cent $CuCl_2$.	Specific Gravity.	Per Cent $CuCl_2$.	Specific Gravity.	Per Cent $CuCl_2$.	Specific Gravity.	Per Cent $CuCl_2$.
1.0182	2	1.1178	12	1.2501	22	1.3950	32
1.0364	4	1.1436	14	1.2779	24	1.4287	34
1.0548	6	1.1696	16	1.3058	26	1.4615	36
1.0734	8	1.1958	18	1.3338	28	1.4949	38
1.0920	10	1.2223	20	1.3618	30	1.5284	40

LXVIII. — Cupric Sulphate Solution at 18°

Specific Gravity.	Per Cent $CuSO_4 . 5H_2O$.	Specific Gravity.	Per Cent $CuSO_4 . 5H_2O$.	Specific Gravity.	Per Cent $CuSO_4 . 5H_2O$.	Specific Gravity.	Per Cent $CuSO_4 . 5H_2O$.
1.0063	1	1.0582	9	1.1135	17	1.1699	24
1.0126	2	1.0649	10	1.1208	18	1.1738	25
1.0190	3	1.0716	11	1.1281	19	1.1817	26
1.0254	4	1.0785	12	1.1354	20	1.1898	27
1.0319	5	1.0854	13	1.1427	21	1.1980	28
1.0384	6	1.0923	14	1.1501	22	1.2063	29
1.0450	7	1.0993	15	1.1585	23	1.2146	30
1.0516	8	1.1063	16				

LIX. — Ferric Chloride Solution at 17.5°

Franz

Specific Gravity.	Per Cent Fe_2Cl_6.	Specific Gravity.	Per Cent Fe_2Cl_6.	Specific Gravity.	Per Cent Fe_2Cl_6.	Specific Gravity.	Per Cent Fe_2Cl_6.	Specific Gravity.	Per Cent Fe_2Cl_6.
1.0146	2	1.1054	14	1.2155	26	1.4311	38	1.4867	50
1.0292	4	1.1215	16	1.2365	28	1.3622	40	1.5153	52
1.0439	6	1.1378	18	1.2568	30	1.3870	42	1.5439	54
1.0587	8	1.1542	20	1.2778	32	1.4118	44	1.5729	56
1.0734	10	1.1746	22	1.2988	34	1.4367	46	1.6023	58
1.0894	12	1.1950	24	1.3199	36	1.4617	48	1.6317	60

LXX. — Ferrous Sulphate at 15°

Gerlach

Specific Gravity.	Per Cent $FeSO_4$.	Per Cent $FeSO_4.7H_2O$.	Specific Gravity.	Per Cent $FeSO_4$.	Per Cent $FeSO_4.7H_2O$.	Specific Gravity.	Per Cent $FeSO_4$.	Per Cent $FeSO_4.7H_2O$.
1.005	0.565	1	1.0267	2.811	5	1.1430	15.834	25
1.011	1.130	2	1.0537	5.784	10	1.1738	19.622	30
1.016	1.694	3	1.0823	8.934	15	1.2063	23.672	35
1.021	2.258	4	1.1124	12.277	20	1.2391	27.995	40

LXXI. — Ferric Sulphate at 18°

Hager

Giving Percentage of Metallic Iron

Specific Gravity.	Per Cent $Fe_2(SO_4)_3$.	Per Cent Fe.	Specific Gravity.	Per Cent $Fe_2(SO_4)_3$.	Per Cent Fe.	Specific Gravity.	Per Cent $Fe_2(SO_4)_3$.	Per Cent Fe.
1.017	2	0.56	1.173	17	4.76	1.351	31	8.68
1.027	3	0.84	1.184	18	5.04	1.365	32	8.96
1.036	4	1.12	1.196	19	5.35	1.380	33	9.24
1.046	5	1.40	1.208	20	5.60	1.395	34	9.52
1.057	6	1.68	1.220	21	5.88	1.411	35	9.80
1.067	7	1.96	1.232	22	6.16	1.427	36	10.08
1.077	8	2.24	1.245	23	6.44	1.442	37	10.36
1.087	9	2.52	1.258	24	6.72	1.458	38	10.67
1.097	10	2.80	1.271	25	7.00	1.474	39	10.92
1.107	11	3.08	1.284	26	7.28	1.490	40	11.20
1.118	12	3.36	1.297	27	7.56	1.506	41	11.48
1.129	13	3.64	1.310	28	7.84	1.523	42	11.76
1.140	14	3.92	1.323	29	8.12	1.540	43	12.04
1.151	15	4.20	1.337	30	8.40	1.557	44	12.32
1.162	16	4.48						

LXXII. — Potassium Chromate Solution at 19.5°

Schiff

Specific Gravity.	Per Cent $K_2Cr_2O_4$.	Specific Gravity.	Per Cent K_2CrO_4.	Specific Gravity.	Per Cent K_2CrO_4.	Specific Gravity.	Per Cent K_2CrO_4.	Specific Gravity.	Per Cent K_2CrO_4.
1.0080	1	1.0750	9	1.1474	17	1.2274	25	1.3151	33
1.0161	2	1.0837	10	1.1570	18	1.2379	26	1.3268	34
1.0243	3	1.0925	11	1.1667	19	1.2485	27	1.3386	35
1.0325	4	1.1014	12	1.1765	20	1.2592	28	1.3505	36
1.0408	5	1.1104	13	1.1864	21	1.2700	29	1.3625	37
1.0492	6	1.1195	14	1.1964	22	1.2808	30	1.3746	38
1.0576	7	1.1287	15	1.2066	23	1.2921	31	1.3868	39
1.0663	8	1.1380	16	1.2169	24	1.3035	32	1.3991	40

LXXIII. — Potassium Dichromate Solution at 19.5°

Kremers and Gerlach

Specific Gravity.	Per Cent $K_2Cr_2O_7$.	Specific Gravity.	Per Cent $K_2Cr_2O_7$.	Specific Gravity.	Per Cent $K_2Cr_2O_7$.	Specific Gravity.	Per Cent $K_2Cr_2O_7$
1.007	1	1.037	5	1.065	9	1.095	13
1.015	2	1.043	6	1.073	10	1.102	14
1.022	3	1.050	7	1.080	11	1.110	15
1.030	4	1.056	8	1.087	12		

LXXIV. — Sodium Chloride Solution at 15°

Gerlach

Specific Gravity.	Per Cent NaCl.	Specific Gravity.	Per Cent NaCl.	Specific Gravity.	Per Cent NaCl.	Specific Gravity.	Per Cent NaCl.
1.00725	1	1.05851	8	1.11146	15	1.16755	22
1.01450	2	1.06593	9	1.11938	16	1.17580	23
1.02174	3	1.07335	10	1.12730	17	1.18404	24
1.02899	4	1.08097	11	1.13523	18	1.19228	25
1.03624	5	1.08859	12	1.14315	19	1.20098	26
1.04366	6	1.09622	13	1.15107	20	1.20433	26.395
1.05108	7	1.10384	14	1.15931	21		

LXXV. — Sodium Dichromate Solution

By Stanley

Specific Gravity.	Per Cent $Na_2Cr_2O_7$.	Specific Gravity.	Per Cent $Na_2Cr_2O_7$.	Specific Gravity.	Per Cent $Na_2Cr_2O_7$.
1.007	1	1.141	20	1.280	40
1.035	5	1.171	25	1.313	45
1.071	10	1.208	30	1.343	50
1.105	15	1.245	35		

LXXVI. — Sodium Hyposulphite

By H. B. Bishop

Bé.° *	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent $Na_2S_2O_3$ 5 H_2O.	Per Cent $Na_2S_2O_3$.	Weight of 1 Cubic Foot in Pounds Avoirdupois.	Pounds $Na_2S_2O_3$. 5 H_2O in 1 Cubic Foot.
10	1.0741	13.75	8.76	66.99	9.21
11	1.0821	15.19	9.68	67.49	10.25
12	1.0902	16.63	10.60	68.00	11.31
13	1.0985	18.09	11.53	68.51	12.39
14	1.1069	19.56	12.46	69.04	13.50
15	1.1154	21.03	13.40	69.57	14.63
16	1.1240	22.51	14.34	70.10	15.78
17	1.1328	24.03	15.31	70.65	16.98
18	1.1417	25.56	16.29	71.21	18.20
19	1.1508	27.12	17.28	71.78	19.47
20	1.1600	28.69	18.28	72.35	20.76
21	1.1694	30.25	19.28	72.94	22.06
22	1.1789	31.82	20.28	73.53	23.40
23	1.1885	33.39	21.28	74.13	24.75
24	1.1983	34.98	22.29	74.74	26.14
25	1.2083	36.59	23.32	75.36	27.57
26	1.2185	38.21	24.35	76.00	29.04
27	1.2288	39.84	25.39	76.64	30.53
28	1.2393	41.49	26.44	77.30	32.07
29	1.2500	43.15	27.50	77.96	33.64
30	1.2609	44.82	28.56	78.64	35.25
31	1.2719	46.49	29.62	79.33	36.88
32	1.2832	48.18	30.70	80.03	38.56
33	1.2946	49.87	31.78	80.74	40.27
34	1.3063	51.60	32.88	81.47	42.04

Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent $Na_2S_2O_3$. $5H_2O$.	Per Cent $Na_2S_2O_3$.	Weight of 1 Cubic Foot in Pounds Avoirdupois.	Pounds $Na_2S_2O_3$. $5H_2O$ in 1 Cubic Foot.
35	1.3182	53.34	33.99	82.22	43.86
36	1.3303	55.10	35.11	82.97	45.72
37	1.3426	56.87	36.24	83.74	47.62
38	1.3551	58.66	37.38	84.52	49.58
39	1.3679	60.46	38.53	85.32	51.58
40	1.3810	62.27	39.68	86.13	53.63
41	1.3942	64.08	40.83	86.96	55.72
42	1.4078	65.92	42.00	87.80	57.88
43	1.4216	67.77	43.18	88.67	60.09
44	1.4356	69.65	44.38	89.54	62.34
45	1.4500	71.61	45.63	90.44	64.76
46	1.4646	73.59	46.89	91.35	67.23
47	1.4796	75.61	48.18	92.28	69.77
48	1.4948	77.64	49.47	93.23	72.39
49	1.5104	79.69	50.78	94.20	75.07
50	1.5263	81.76	52.10	95.20	77.84
51	1.5426	83.83	53.42	96.21	80.65
52	1.5591	85.90	54.74	97.24	83.53
53	1.5761	87.98	56.06	98.30	86.48
54	1.5934	90.04	57.38	99.38	89.48
55	1.6111	92.03	58.64	100.48	92.48
56	1.6292	93.93	59.85	101.61	95.44
57	1.6477	95.73	61.00	102.77	98.38
58	1.6667	97.43	62.08	103.95	101.27
59	1.6860	99.03	63.10	105.16	104.14
59.63	1.6984	100.00	63.72	105.93	105.93

Specific gravity determinations were made at 60° F., compared with water at 60° F.

From the specific gravities, the corresponding degrees Baumé were calculated by the following formula:

$$\text{Bé. } 145 - \frac{145}{\text{sp. gr.}}.$$

* Baumé hydrometers for use with this table must be graduated by the above formula, which formula should *always* be printed on the scale.

Allowance for Temperature

At 15° Bé. 0.026° Bé. or 0.00022 sp. gr. = 1° F.
20° Bé. 0.027° Bé. or 0.00025 sp. gr. = 1° F.
30° Bé. 0.026° Bé. or 0.00029 sp. gr. = 1° F.
40° Bé. 0.024° Bé. or 0.00032 sp. gr. = 1° F.
50° Bé. 0.020° Bé. or 0.00033 sp. gr. = 1° F.
59° Bé. 0.017° Bé. or 0.00032 sp. gr. = 1° F.

LXXVII. — Sodium Sulphite

By H. B. Bishop

Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent Na_2SO_3.	Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent Na_2SO_3.
15.00	1.1154	11.67	19.25	1.1531	15.20
15.25	1.1176	11.87	19.50	1.1554	15.42
15.50	1.1197	12.06	19.75	1.1577	15.64
15.75	1.1219	12.26	20.00	1.1600	15.86
16.00	1.1240	12.45	20.25	1.1624	16.09
16.25	1.1262	12.65	20.50	1.1647	16.31
16.50	1.1284	12.85	20.75	1.1671	16.54
16.75	1.1306	13.06	21.00	1.1694	16.77
17.00	1.1328	13.27	21.25	1.1718	17.00
17.25	1.1350	13.48	21.50	1.1741	17.22
17.50	1.1373	13.69	21.75	1.1765	17.44
17.75	1.1395	13.90	22.00	1.1789	17.66
18.00	1.1417	14.11	22.25	1.1813	17.88
18.25	1.1440	14.33	22.50	1.1837	18.10
18.50	1.1462	14.54	22.75	1.1861	18.33
18.75	1.1485	14.76	23.00	1.1885	18.56
19.00	1.1508	14.98	23.25	1.1910	18.80

Solution at 212° F.

Bé.°	Specific Gravity $\frac{212°}{60°}$ F.	Per Cent Na_2SO_3.	Bé.°	Specific Gravity $\frac{212°}{60°}$ F.	Per Cent Na_2SO_3.
21.75	1.1765	21.90	22.25	1.1813	22.47
22.00	1.1789	22.18	22.50	1.1837	22.75

Allowance for Temperature

15–23° Bé.°–40° F. = 1° Bé.°

Fixed Points at 60° F.

	Per Cent.		Per Cent.
1.1138...............	11.52	1.1702...............	16.85
1.1323...............	13.22	1.1864...............	18.36
1.1494...............	14.85	1.1913...............	18.82

At 212° F.

	Per Cent.
1.1768..	21.93
1.1841..	22.80

LXXVIII. — Sodium Bisulphite

By H. B. Bishop

Bé.°*	Specific Gravity.	Per Cent $NaHSO_3$.	Bé.°	Specific Gravity.	Per Cent $NaHSO_3$.
0.00	1.0000	0.00	8.75	1.0642	9.03
0.25	1.0016	0.25	9.00	1.0662	9.30
0.50	1.0034	0.51	9.25	1.0681	9.56
0.75	1.0051	0.76	9.50	1.0701	9.83
1.00	1.0069	1.02	9.75	1.0721	10.09
1.25	1.0086	1.27	10.00	1.0741	10.36
1.50	1.0104	1.53	10.25	1.0761	10.62
1.75	1.0122	1.78	10.50	1.0781	10.89
2.00	1.0140	2.04	10.75	1.0801	11.15
2.25	1.0157	2.29	11.00	1.0821	11.42
2.50	1.0175	2.55	11.25	1.0841	11.68
2.75	1.0193	2.80	11.50	1.0861	11.95
3.00	1.0211	3.06	11.75	1.0881	12.21
3.25	1.0229	3.31	12.00	1.0902	12.48
3.50	1.0247	3.57	12.25	1.0922	12.75
3.75	1.0265	3.82	12.50	1.0943	13.02
4.00	1.0284	4.08	12.75	1.0964	13.29
4.25	1.0302	4.33	13.00	1.0985	13.56
4.50	1.0320	4.59	13.25	1.1006	13.83
4.75	1.0338	4.85	13.50	1.1027	14.10
5.00	1.0357	5.11	13.75	1.1048	14.38
5.25	1.0375	5.37	14.00	1.1069	14.65
5.50	1.0394	5.63	14.25	1.1090	14.93
5.75	1.0413	5.89	14.50	1.1111	15.20
6.00	1.0432	6.15	14.75	1.1132	15.48
6.25	1.0450	6.41	15.00	1.1154	15.75
6.50	1.0469	6.67	15.25	1.1175	16.03
6.75	1.0488	6.93	15.50	1.1197	16.30
7.00	1.0507	7.19	15.75	1.1218	16.58
7.25	1.0526	7.45	16.00	1.1240	16.85
7.50	1.0545	7.71	16.25	1.1262	17.13
7.75	1.0564	7.97	16.50	1.1284	17.40
8.00	1.0584	8.24	16.75	1.1306	17.68
8.25	1.0603	8.50	17.00	1.1328	17.96
8.50	1.0623	8.77	17.25	1.1350	18.24

Bé.°	Specific Gravity.	Per Cent $NaHSO_3$.	Bé.°	Specific Gravity.	Per Cent $NaHSO_3$.
17.50	1.1372	18.52	27.50	1.2340	29.85
17.75	1.1394	18.80	27.75	1.2366	30.14
18.00	1.1417	19.08	28.00	1.2393	30.43
18.25	1.1439	19.36	28.25	1.2419	30.72
18.50	1.1462	19.64	28.50	1.2446	31.00
18.75	1.1485	19.92	28.75	1.2473	31.29
19.00	1.1508	20.20	29.00	1.2500	31.57
19.25	1.1531	20.48	29.25	1.2527	31.86
19.50	1.1554	20.76	29.50	1.2554	32.14
19.75	1.1577	21.04	29.75	1.2581	32.43
20.00	1.1600	21.32	30.00	1.2609	32.71
20.25	1.1623	21.60	30.25	1.2636	33.00
20.50	1.1647	21.88	30.50	1.2664	33.28
20.75	1.1670	22.16	30.75	1.2691	33.57
21.00	1.1694	22.44	31.00	1.2719	33.86
21.25	1.1717	22.72	31.25	1.2747	34.14
21.50	1.1741	23.00	31.50	1.2775	34.43
21.75	1.1765	23.28	31.75	1.2803	34.71
22.00	1.1789	23.57	32.00	1.2832	35.01
22.25	1.1813	23.85	32.25	1.2860	35.31
22.50	1.1837	24.14	32.50	1.2889	35.62
22.75	1.1861	24.42	32.75	1.2917	35.94
23.00	1.1885	24.71	33.00	1.2946	36.25
23.25	1.1909	24.99	33.25	1.2975	36.57
23.50	1.1934	25.28	33.50	1.3004	36.88
23.75	1.1958	25.56	33.75	1.3033	37.20
24.00	1.1983	25.85	34.00	1.3063	37.51
24.25	1.2008	26.13	34.25	1.3092	37.83
24.50	1.2033	26.42	34.50	1.3122	38.14
24.75	1.2058	26.70	34.75	1.3152	38.46
25.00	1.2083	26.99	35.00	1.3182	38.78
25.25	1.2108	27.27	35.25	1.3212	39.10
25.50	1.2134	27.56	35.50	1.3242	39.42
25.75	1.2159	27.84	35.75	1.3272	39.74
26.00	1.2185	28.13	36.00	1.3303	40.06
26.25	1.2210	28.41	36.25	1.3333	40.38
26.50	1.2236	28.70	36.50	1.3364	40.69
26.75	1.2262	28.98	36.75	1.3395	41.00
27.00	1.2288	29.27	37.00	1.3426	41.30
27.25	1.2314	29.56	37.25	1.3457	41.61

Bé.°	Specific Gravity.	Per Cent $NaHSO_3$.	Bé.°	Specific Gravity.	Per Cent $NaHSO_3$.
37.50	1.3488	41.91	38.50	1.3615	43.12
37.75	1.3519	42.22	38.75	1.3647	43.42
38.00	1.3551	42.52	39.00	1.3680	43.72
38.25	1.3583	42.82	39.25	1.3712	44.02

Specific gravity determinations were made at 60° F., compared with water at 60° F.

From the specific gravities, the corresponding degrees Baumé were calculated by the following formula:

$$\text{Baumé} = 145 - \frac{145}{\text{sp. gr.}}.$$

* Baumé hydrometers for use with this table must be graduated by the above formula, which formula should *always* be printed on the scale.

Atomic weights from F. W. Clarke's table of 1901. O = 16.

ALLOWANCE FOR TEMPERATURE

At 5° Bé. 54° F. = 1° Bé.	At 27° Bé. 37° F. = 1° Bé.
12° Bé. 43° F. = 1° Bé.	32° Bé. 38° F. = 1° Bé.
16° Bé. 41° F. = 1° Bé.	36° Bé. 39° F. = 1° Bé.
21° Bé. 39° F. = 1° Bé.	39° Bé. 40° F. = 1° Bé.

LXXIX. — STANNIC CHLORIDE SOLUTION AT 15°

BY GERLACH

Specific Gravity.	Per Cent $SnCl_4 . 5H_2O$.	Specific Gravity.	Per Cent $SnCl_4 . 5H_2O$.	Specific Gravity.	Per Cent $SnCl_4 . 5H_2O$.	Specific Gravity.	Per Cent $SnCl_4 . 5H_2O$.	Specific Gravity.	Per Cent $SnCl_4 . 5H_2O$.
1.012	2	1.137	22	1.293	42	1.491	62	1.759	82
1.024	4	1.151	24	1.310	44	1.514	64	1.791	84
1.036	6	1.165	26	1.329	46	1.538	66	1.824	86
1.048	8	1.180	28	1.347	48	1.563	68	1.859	88
1.059	10	1.195	30	1.366	50	1.587	70	1.893	90
1.072	12	1.210	32	1.386	52	1.614	72	1.932	92
1.084	14	1.2268	34	1.406	54	1.641	74	1.969	94
1.097	16	1.242	36	1.426	56	1.669	76	1.988	96
1.110	18	1.259	38	1.447	58	1.698	78		
1.1236	20	1.2755	40	1.468	60	1.727	80		

LXXX. — Stannous Chloride Solution at 15°

By Gerlach

Specific Gravity.	Per Cent $SnCl_2 \cdot 2H_2O$.	Specific Gravity.	Per Cent $SnCl_2 \cdot 2H_2O$.	Specific Gravity.	Per Cent $SnCl_2 \cdot 2H_2O$.	Specific Gravity.	Per Cent $SnCl_2 \cdot 2H_2O$.	Specific Gravity.	Per Cent $SnCl_2 \cdot 2H_2O$.
1.013	2	1.128	18	1.268	34	1.445	50	1.677	66
1.026	4	1.144	20	1.288	36	1.471	52	1.711	68
1.040	6	1.161	22	1.309	38	1.497	54	1.745	70
1.054	8	1.177	24	1.330	40	1.525	56	1.783	72
1.068	10	1.194	26	1.352	42	1.554	58	1.821	74
1.083	12	1.212	28	1.374	44	1.582	60	1.840	75
1.097	14	1.230	30	1.395	46	1.613	62		
1.113	16	1.249	32	1.421	48	1.644	64		

LXXXI. — Zinc Chloride

By H. B. Bishop

Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent $ZnCl_2$.	Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent $ZnCl_2$.	Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent $ZnCl_2$.
5.0	1.0357	3.75	14.0	1.1069	11.49	23.0	1.1885	20.00
5.5	1.0394	4.19	14.5	1.1111	11.97	23.5	1.1934	20.48
6.0	1.0432	4.63	15.0	1.1154	12.45	24.0	1.1983	20.96
*6.18	1.0445	4.79	15.5	1.1197	12.89	24.5	1.2033	21.45
6.5	1.0469	5.00	16.0	1.1240	13.32	25.0	1.2083	21.94
7.0	1.0507	5.41	16.5	1.1284	13.77	25.5	1.2134	22.44
7.5	1.0545	5.85	*16.66	1.1298	13.90	26.0	1.2185	22.94
8.0	1.0584	6.31	17.0	1.1328	14.23	26.5	1.2236	23.39
8.5	1.0623	6.71	17.5	1.1373	14.64	26.6	1.2247	23.49
9.0	1.0662	7.12	18.0	1.1417	15.16	27.0	1.2288	23.84
9.5	1.0701	7.52	18.5	1.1468	15.63	27.5	1.2340	24.49
10.0	1.0741	7.94	19.0	1.1508	16.11	28.0	1.2393	25.14
10.5	1.0781	8.35	19.5	1.1554	16.59	28.5	1.2446	25.75
*10.54	1.0784	8.39	20.0	1.1600	17.07	29.0	1.2500	26.36
11.0	1.0821	8.78	20.5	1.1647	17.56	29.5	1.2554	26.98
11.5	1.0861	9.24	21.0	1.1694	18.05	30.0	1.2609	27.60
12.0	1.0902	9.70	21.5	1.1741	18.49	30.5	1.2664	28.33
12.5	1.0943	10.17	*21.91	1.1780	18.86	31.0	1.2719	28.85
13.0	1.0985	10.64	22.0	1.1789	18.97	*31.38	1.2762	29.34
13.5	1.1027	11.07	22.5	1.1837	19.35	31.5	1.2775	29.42

* Specific gravity determinations and analysis made on these samples.

Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent $ZnCl_2$.	Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent $ZnCl_2$.	Bé.°	Specific Gravity $\frac{60°}{60°}$ F.	Per Cent $ZnCl_2$.
32	1.2832	29.83	48.5	1.5026	45.77	65	1.8125	63.80
32.5	1.2889	30.21	49	1.5104	46.34	65.5	1.8239	64.30
33	1.2946	30.59	*49.11	1.5122	46.45	66	1.8354	64.86
33.5	1.3004	31.01	49.5	1.5183	46.77	66.5	1.8471	65.39
34	1.3063	31.44	50	1.5263	47.44	67	1.8590	65.93
34.5	1.3122	31.84	50.5	1.5344	47.94	67.5	1.8710	66.47
35	1.3182	32.23	51	1.5426	48.46	68	1.8831	67.01
35.5	1.3242	32.63	51.5	1.5508	48.94	68.5	1.8954	67.55
*35.95	1.3297	33.00	52	1.5591	49.43	*68.86	1.9044	67.88
36	1.3303	33.07	52.5	1.5676	49.93	69	1.9079	68.09
36.5	1.3364	33.57	53	1.5761	50.43	*69.30	1.9155	68.56
37	1.3426	34.09	53.5	1.5847	50.93	69.5	1.9205	68.62
37.5	1.3488	34.56	*53.57	1.5857	50.99	70	1.9333	69.15
*37.81	1.3527	34.86	54	1.5934	51.52	70.5	1.9463	69.67
38	1.3551	35.04	54.5	1.6022	52.07	71	1.9595	70.20
38.5	1.3615	35.52	55	1.6111	52.63	71.5	1.9728	70.71
39	1.3679	35.99	55.5	1.6201	53.19	72	1.9863	71.23
39.5	1.3744	36.48	56.05	1.6292	53.75	72.5	2.0000	71.74
40	1.3810	36.97	56.5	1.6384	54.30	73	2.0139	72.26
40.5	1.3876	37.47	57	1.6477	54.84	73.5	2.0280	72.78
41	1.3942	37.95	57.5	1.6571	55.44	74	2.0423	73.31
41.5	1.4010	38.43	58	1.6667	56.03	74.5	2.0567	73.83
42	1.4078	38.89	58.5	1.6763	56.57	75	2.0714	74.35
42.5	1.4146	39.41	*58.74	1.6810	56.87	*75.23	2.0782	74.59
43	1.4216	39.92	59	1.6860	57.14	75.5	2.0863	75.10
43.5	1.4286	40.38	59.5	1.6959	57.69	76	2.1014	75.85
44	1.4356	40.82	60	1.7059	58.25	76.5	2.1168	76.63
44.5	1.4428	41.30	60.5	1.7160	58.82	77	2.1323	77.43
*44.76	1.4465	41.58	61	1.7262	59.39	77.5	2.1481	78.19
45	1.4500	41.87	61.5	1.7365	59.94	78	2.1642	78.97
45.5	1.4573	42.42	62	1.7470	60.50	*78.08	2.1668	79.09
46	1.4646	42.95	62.5	1.7576	61.07	*78.14	2.1687	79.19
46.5	1.4721	43.55	63	1.7683	61.63	78.5	2.1805	79.79
47	1.4796	44.13	63.5	1.7791	62.17	79	2.1970	80.60
47.5	1.4872	44.67	64	1.7901	62.71	79.5	2.2137	81.35
48	1.4948	45.18	64.5	1.8012	63.25	80	2.2307	82.12

* Specific gravity determinations and analysis made on these samples.

Allowance for Temperature

At 55° Bé. 38° F. = 1° Bé. At 70° Bé. 62° F. = 1°.
60° Bé. 38° F. = 1° Bé. 75° Bé. 68° F. = 1°.
65° Bé. 38° F. = 1° Bé. 80° Bé. 47° F. = 1°.

ALLOWANCE FOR TEMPERATURE

At 5° Bé. 50° F. = 1° Bé.	At 30° Bé. 30° F. = 1° Bé.
10° Bé. 47° F. = 1° Bé.	35° Bé. 32° F. = 1° Bé.
15° Bé. 38° F. = 1° Bé.	40° Bé. 31° F. = 1° Bé.
20° Bé. 31° F. = 1° Bé.	45° Bé. 30° F. = 1° Bé.
25° Bé. 30° F. = 1° Bé.	50° Bé. 34° F. = 1° Bé.

The specific gravity determinations and analysis made on these samples.

Solution proved neutral by gravimetric determinations of zinc and chlorine; solution is neutral to methyl-orange.

Specific gravity determinations made by bottle method.

Baumé corresponding to specific gravity calculated from the sulphuric acid tables of the Manufacturing Chemists Association of the United States.

Above 66° Bé. the calculation was made according to the formula:

$$\text{Bé.} = 145 - \frac{145}{\text{sp. gr.}}.$$

Methods of analysis: — Zinc precipitated with sodium carbonate and weighed as ZnO. Chlorine precipitated with silver nitrate and weighed as AgCl. Chlorine determinations made on each sample analyzed. Zinc determinations made on every other sample.

All work done in duplicate by two men independently.

LAUREL HILL LABORATORY, Jan. 24, 1902.

LXXXII. — ZINC, CADMIUM AND LITHIUM CHLORIDE AT 19.5°

BY KRÄMER

Specific Gravity.			Per Cent Salt.	Specific Gravity.			Per Cent Salt.
$ZnCl_2$.	$CdCl_2$.	LiCl.		$ZnCl_2$.	$CdCl_2$.	LiCl.	
1.045	1.045		5	1.352			35
1.091	1.089	1.0580	10	1.420	1.472	1.2557	40
1.137	1.140		15	1.488			45
1.186	1.195	1.1172	20	1.566	1.656		50
1.238	1.256		25	1.650			55
1.291	1.321	1.1819	30	1.740	1.890		60

LXXXIII. — ZINC SULPHATE SOLUTION AT 15°

Specific Gravity.	Per Cent $ZnSO_4 \cdot 7H_2O$.	Specific Gravity.	Per Cent $ZnSO_4 \cdot 7H_2O$.	Specific Gravity.	Per Cent $ZnSO_4 \cdot 7H_2O$.
1.029	5	1.167	25	1.310	45
1.059	10	1.193	30	1.352	50
1.091	15	1.231	35	1.399	55
1.124	20	1.271	40	1.445	60

LXXXIV. — Density of Water at 0° to 36°

Weight in Grams of One Cubic Centimeter of Water Free from Air at Temperatures of 0 to 36 Centigrade by the Hydrogen Thermometer — According to Thiesen, Scheel, and Diesselhorst Wiss. Abh. d. Phys. — Techn. Reichsanst. 3, 68: 1900

Degrees.	Tenths of Degrees.									
	0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	0.999868	874	881	887	893	899	905	911	916	922
1	927	932	936	941	945	950	954	957	961	965
2	968	971	974	977	980	982	985	987	989	991
3	992	994	995	996	997	998	999	999	*000	*000
4	1.000000	000	000	*999	*999	*998	*997	*996	*995	*993
5	0.999992	990	988	986	984	982	979	977	974	971
6	986	965	962	958	954	951	947	943	938	934
7	929	925	920	915	910	904	899	893	888	882
8	876	870	864	857	851	844	837	830	823	816
9	808	801	793	785	778	769	761	753	744	736
10	727	718	709	700	691	681	672	662	652	642
11	632	622	612	601	591	580	569	558	547	536
12	525	513	502	490	478	466	454	442	429	417
13	404	391	379	366	353	339	326	312	299	285
14	271	257	243	229	215	200	186	171	156	141
15	126	111	096	081	065	050	034	018	002	*986
16	0.998970	953	937	920	904	887	870	853	836	819
17	801	784	766	749	731	713	695	677	659	640
18	622	603	585	566	547	528	509	490	471	451
19	432	412	392	372	352	332	312	292	271	251
20	230	210	189	168	147	126	105	083	062	040
21	019	*997	*975	*953	*931	*909	*887	*864	*842	*819
22	0.997797	774	751	728	705	682	659	635	612	588
23	565	541	517	493	469	445	421	396	372	347
24	323	298	273	248	223	198	173	147	122	096
25	071	045	019	*994	*968	*941	*915	*889	*863	*836
26	0.996810	783	756	730	703	676	648	621	594	567
27	539	512	484	456	428	400	372	344	316	288
28	259	231	202	174	145	116	087	058	029	000
29	0.995971	941	912	882	853	823	793	763	733	703
30	673	643	613	582	552	521	491	460	429	398
31	367	336	305	273	242	211	179	148	116	084
32	052	020	*988	*956	*924	*892	*859	*827	*794	*762
33	0.994729	696	663	630	597	564	531	498	464	431
34	398	364	330	296	263	229	195	161	126	092
35	058	023	*989	*954	*920	*885	*850	*815	*780	*745

LXXXV. — Density of Water at 30° to 102°

Weight in Grams of One Cubic Centimeter of Water Free from Air at Temperatures of 30° to 102° Centigrade by the Hydrogen Thermometer — According to M. Thiesen

Wiss. Abh. d. Phys. — Techn. Reichsanst. 4, 1: 1904

Degrees.	0	1	2	3	4	5	6	7	8	9
30	0.99567	537	505	473	440	406	371	336	299	262
40	224	186	147	107	066	025	*982	*940	*896	*852
50	0.98807	762	715	669	621	573	525	475	425	375
60	324	272	220	167	113	059	005	*950	*894	*838
70	0.97781	723	666	607	548	489	429	368	307	245
80	183	121	057	*994	*930	*865	*800	*734	*668	*601
90	0.96534	467	399	330	261	192	122	051	*981	*909
100	0.95838	765	693							

LXXXVI. — Density of Water at 100° to 320°

Weight in Grams of One Cubic Centimeter of Water at Temperatures of 100° to 320° Centigrade

According to W. Ramsay, S. Young, J. J. Waterston, and G. A. Hirn

°C.	Density.	°C.	Density.	°C.	Density.	°C.	Density.
100	0.9585	160	0.9075	220	0.837	280	0.75
110	0.9510	170	0.8973	230	0.823	290	0.72
120	0.9434	180	0.8866	240	0.809	300	0.70
130	0.9352	190	0.8750	250	0.794	310	0.68
140	0.9264	200	0.8628	260	0.779	320	0.66
150	0.9173	210	0.850	270	0.765		

To reduce the densities of water free from air to the density of water containing air add .000003 for temperatures of 0 to 14, .000002 for temperatures of 15 to 19. For higher temperatures the correction is negligible.

LXXXVII. — Volume in Cubic Centimeters of One Gram of Water at 0° to 36° Centigrade

By the Hydrogen Thermometer — According to Thiesen, Scheel, and Diesselhorst
Wiss. Abh. d. Phys. — Techn. Reichsanst. 3, 69: 1900

Degrees.	Tenths of Degrees									
	0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	1.000132	126	119	113	107	101	095	089	084	079
1	073	069	064	059	055	051	047	043	039	035
2	032	029	026	023	020	018	016	013	011	009
3	008	006	005	004	003	002	001	001	000	000
4	000	000	000	001	001	002	003	004	005	007
5	008	010	012	014	016	018	021	023	026	029
6	032	035	039	042	046	050	054	058	062	066
7	071	075	080	085	090	096	101	107	112	118
8	124	130	137	143	149	156	163	170	177	184
9	192	199	207	215	223	231	239	247	256	264
10	273	282	291	300	390	319	328	338	348	358
11	368	378	388	399	409	420	431	442	453	464
12	476	487	499	511	522	534	547	559	571	584
13	596	609	622	635	648	661	675	688	702	715
14	729	743	757	772	786	800	815	830	844	859
15	874	890	905	920	936	951	967	983	999	*015
16	1.001031	048	064	081	098	114	131	148	165	183
17	200	218	235	253	271	289	307	325	343	361
18	380	399	417	436	455	474	493	513	532	551
19	571	591	610	630	650	671	691	711	732	752
20	773	794	815	836	857	878	899	921	942	964
21	985	*007	*029	*051	*073	*096	*118	*140	*163	*186
22	1.002208	231	254	277	300	324	347	370	394	418
23	441	465	489	513	538	562	586	611	635	660
24	685	710	735	760	785	810	835	861	886	912
25	938	964	990	*016	*042	*068	*094	*121	*147	*174
26	1.003201	227	254	281	308	336	363	390	418	445
27	473	501	529	556	585	613	641	669	698	726
28	755	783	812	841	870	899	928	957	987	*016
29	1.004046	075	105	135	165	194	225	255	285	315
30	346	376	407	437	468	499	530	561	592	623
31	655	686	717	749	781	812	844	876	908	940
32	972	*005	*037	*070	*102	*135	*167	*200	*233	*266
33	1.005299	332	365	399	432	465	499	533	566	600
34	634	668	702	736	771	805	839	874	908	943
35	978	*013	*047	*082	*118	*153	*188	*223	*259	*294

LXXXVIII. — Volume in Cubic Centimeters of One Gram of Water at 30° to 102° Centigrade

By the Hydrogen Thermometer — According to M. Thiesen
Wiss. Abh. d. Phys. — Techn. Reichsanst. 4, 1: 1904

Degrees.	0	1	2	3	4	5	6	7	8	9
30	1.00435	466	497	530	563	598	633	669	706	743
40	782	821	861	901	943	985	*028	*072	*116	*162
50	1.01207	254	301	349	398	448	498	548	600	652
60	705	758	813	867	923	979	*036	*093	*151	*210
70	1.02270	330	390	452	514	576	639	703	768	833
80	899	965	*032	*099	*168	*237	*306	*376	*447	*518
90	1.03590	663	736	810	884	959	*035	*111	*188	*265
100	1.04343	422	501							

To reduce the volumes of water free from air to the volume of water containing air add .000003 for temperatures of 0 to 14, .000002 for temperatures of 15 to 19. For higher temperatures the correction is negligible.

LXXXIX. — Volume in Cubic Centimeters of One Gram of Water at 100° to 320° Centigrade

According to W. Ramsay, S. Young, J. J. Waterston, and G. A. Hirn

°C.	Cubic Cent.	°C.	Cubic Cent.	°C.	Cubic Cent.	°C.	Cubic Cent.
100	1.0433	160	1.1019	220	1.195	280	1.34
110	1.0515	170	1.1145	230	1.215	290	1.38
120	1.0601	180	1.1279	240	1.236	300	1.42
130	1.0693	190	1.1429	250	1.259	310	1.46
140	1.0794	200	1.1590	260	1.283	320	1.51
150	1.0902	210	1.177	270	1.308		

XC. — Tension of Water Vapor Over Ice in Millimeters of Mercury

According to Juhlin and Marvin

°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
−50	0.034	−37	0.141	−24	0.534	−11	1.806
−49	0.038	−36	0.156	−23	0.589	−10	1.974
−48	0.043	−35	0.173	−22	0.648	− 9	2.154
−47	0.048	−34	0.193	−21	0.714	− 8	2.347
−46	0.054	−33	0.215	−20	0.787	− 7	2.557
−45	0.061	−32	0.238	−19	0.868	− 6	2.785
−44	0.068	−31	0.264	−18	0.955	− 5	3.032
−43	0.076	−30	0.292	−17	1.048	− 4	3.299
−42	0.085	−29	0.324	−16	1.148	− 3	3.586
−41	0.095	−28	0.358	−15	1.257	− 2	3.894
−40	0.105	−27	0.397	−14	1.375	− 1	4.223
−39	0.115	−26	0.438	−13	1.506	− 0	4.579
−38	0.127	−25	0.484	−12	1.650		

XCI. — Tension of Water Vapor Over Water in Millimeters of Mercury

According to Regnault, Broch, and Juhlin

°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
−20	0.960	−14	1.573	− 9	2.335	− 4	3.413
−19	1.044	−13	1.705	− 8	2.521	− 3	3.677
−18	1.135	−12	1.846	− 7	2.722	− 2	3.958
−17	1.233	−11	1.997	− 6	2.937	− 1	4.258
−16	1.338	−10	2.159	− 5	3.167	− 0	4.579
−15	1.451						

XCII. — Vapor Tension of Water in Millimeters of Mercury – 2° to + 36° C.

According to Regnault, Broch, and Weibe

°C.	0	.1	.2	.3	.4	.5	.6	.7	.8	.9
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
–2	3.958	3.929	3.900	3.872	3.844	3.815	3.787	3.760	3.732	3.705
–1	4.258	4.227	4.197	4.166	4.136	4.106	4.076	4.046	4.016	3.987
–0	4.579	4.546	4.513	4.481	4.448	4.416	4.384	4.352	4.321	4.289
0	4.579	4.612	4.646	4.679	4.713	4.747	4.782	4.816	4.851	4.886
1	4.921	4.957	4.992	5.028	5.064	5.101	5.137	5.174	5.211	5.248
2	5.286	5.324	5.362	5.400	5.438	5.477	5.516	5.555	5.595	5.635
3	5.675	5.715	5.755	5.796	5.837	5.878	5.920	5.961	6.003	6.046
4	6.088	6.131	6.174	6.217	6.261	6.305	6.349	6.393	6.438	6.483
5	6.528	6.574	6.620	6.666	6.712	6.759	6.806	6.853	6.901	6.949
6	6.997	7.045	7.094	7.143	7.192	7.242	7.292	7.342	7.392	7.443
7	7.494	7.546	7.598	7.650	7.702	7.755	7.808	7.861	7.914	7.968
8	8.023	8.077	8.132	8.187	8.243	8.299	8.355	8.412	8.469	8.526
9	8.584	8.642	8.700	8.759	8.818	8.877	8.937	8.997	9.057	9.118
10	9.179	9.240	9.302	9.364	9.427	9.490	9.553	9.616	9.680	9.745
11	9.810	9.875	9.940	10.006	10.072	10.139	10.206	10.274	10.342	10.410
12	10.479	10.548	10.617	10.687	10.757	10.828	10.899	10.970	11.042	11.114
13	11.187	11.260	11.333	11.407	11.481	11.556	11.631	11.706	11.782	11.859
14	11.936	12.013	12.091	12.169	12.247	12.326	12.406	12.486	12.566	12.647
15	12.728	12.810	12.892	12.974	13.057	13.141	13.225	13.309	13.394	13.480
16	13.565	13.651	13.738	13.825	13.913	14.001	14.090	14.179	14.269	14.359
17	14.450	14.541	14.632	14.724	14.817	14.910	15.003	15.097	15.192	15.287
18	15.383	15.479	15.575	15.672	15.770	15.868	15.967	16.066	16.166	16.266
19	16.367	16.469	16.571	16.673	16.776	16.880	16.984	17.088	17.193	17.299
20	17.406	17.513	17.620	17.728	17.837	17.947	18.057	18.167	18.278	18.390
21	18.503	18.616	18.729	18.844	18.959	19.074	19.190	19.307	19.424	19.542
22	19.661	19.780	19.900	20.021	20.142	20.264	20.386	20.510	20.634	20.758
23	20.883	21.010	21.137	21.264	21.393	21.522	21.652	21.782	21.913	22.045
24	22.178	22.311	22.446	22.581	22.716	22.853	22.990	23.128	23.266	23.406
25	23.546	23.686	23.828	23.970	24.113	24.257	24.401	24.547	24.693	24.839
26	24.987	25.135	25.284	25.434	25.584	25.736	25.888	26.041	26.195	26.349
27	26.505	26.661	26.818	26.976	27.134	27.294	27.454	27.615	27.777	27.939
28	28.103	28.267	28.432	28.599	28.766	28.933	29.102	29.271	29.442	29.613
29	29.785	29.958	30.132	30.307	30.482	30.659	30.836	31.015	31.194	31.374
30	31.555	31.737	31.919	32.103	32.288	32.473	32.660	32.847	33.036	33.225
31	33.416	33.607	33.799	33.992	34.187	34.382	34.578	34.775	34.973	35.172
32	35.372	35.573	35.775	35.978	36.182	36.387	36.593	36.800	37.008	37.217
33	37.427	37.638	37.851	38.064	38.278	38.493	38.710	38.927	39.146	39.365
34	39.586	39.807	40.030	40.254	40.479	40.705	40.933	41.161	41.390	41.621
35	41.583	42.085	42.319	42.554	42.791	43.028	43.266	43.506	43.747	43.989

XCIII. — Vapor Tension of Water in Millimeters of Mercury 30° to 230°

According to Regnault, Broch, and Wiebe

Degrees.	0	1	2	3	4	5	6	7	8	9
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
30	31.56	33.42	35.37	37.43	39.59	41.85	44.23	46.73	49.35	52.09
40	54.97	57.98	61.13	64.43	67.89	71.50	75.28	79.23	83.36	87.67
50	92.17	96.87	101.77	106.88	112.21	117.77	123.56	129.59	135.87	142.41
60	149.21	156.29	163.65	171.30	179.25	187.51	196.09	204.99	214.24	223.84
70	233.79	244.11	254.84	265.91	277.41	289.32	301.65	314.42	327.64	341.32
80	355.47	370.11	385.25	400.90	417.08	433.79	451.07	468.91	487.33	506.36
90	526.00	546.27	567.19	588.77	611.04	634.01	657.69	682.11	707.29	733.24
100	760.00	787.57	816.0	845.3	875.4	906.4	938.3	971.1	1004.9	1039.6
110	1075.4	1112.1	1149.8	1188.6	1228.4	1269.4	1311.5	1354.7	1399.0	1444.5
120	1491	1539	1588	1639	1691	1744	1798	1854	1911	1970
130	2030	2092	2155	2220	2286	2354	2423	2494	2567	2641
140	2718	2795	2875	2957	3040	3125	3213	3302	3393	3486
150	3581	3678	3778	3879	3983	4088	4196	4307	4419	4534
160	4651	4771	4893	5018	5145	5274	5406	5541	5678	5819
170	5961	6107	6255	6406	6560	6717	6877	7040	7205	7374
180	7546	7721	7899	8080	8265	8453	8644	8838	9036	9237
190	9442	9650	9862	10078	10296	10519	10745	10975	11209	11447
200	11688	11934	12183	12436	12694	12955	13220	13490	13764	14042
210	14324	14611	14901	15197	15496	15800	16109	16422	16740	17062
220	17389	17721	18058	18399	18745	19096	19452	19813	20179	20549
230	20925									

XCIV. — Vapor Pressure of Water

According to Regnault

°C.	°F.	Inches of Mercury.	Pounds per sq. inch.	Grams per sq. Centimeter.	°C.	°F.	Inches of Mercury.	Pounds per sq. inch.	Grams per sq. Centimeter.
0	32.0	0.181	0.0890	6.254	38	100.4	1.941	0.954	67.026
1	33.8	0.194	0.0955	6.716	39	102.2	2.049	1.007	70.752
2	35.6	0.209	0.1025	7.206	40	104.0	2.162	1.061	74.653
3	37.4	0.224	0.1100	7.736	41	105.8	2.280	1.121	78.678
4	39.2	0.240	0.1180	8.291	42	107.6	2.404	1.216	82.947
5	41.0	0.257	0.1263	8.878	43	109.4	2.533	1.244	87.488
6	42.8	0.276	0.1354	9.517	44	111.2	2.669	1.312	92.165
7	44.6	0.295	0.1452	10.183	45	113.0	2.811	1.381	97.059
8	46.4	0.316	0.1551	10.904	46	114.8	2.959	1.454	102.184
9	48.2	0.338	0.1657	11.651	47	116.6	3.114	1.530	107.528
10	50.0	0.361	0.1773	12.467	48	118.4	3.276	1.609	113.115
11	51.8	0.386	0.1893	13.310	49	120.2	3.444	1.692	118.962
12	53.6	0.412	0.2023	14.207	50	122.0	3.62	1.78	125.05
13	55.4	0.439	0.2158	15.173	51	123.8	3.81	1.87	131.42
14	57.2	0.469	0.2303	16.192	52	125.6	4.00	1.96	138.04
15	59.0	0.500	0.2456	17.266	53	127.4	4.20	2.06	144.98
16	60.8	0.533	0.2618	18.408	54	129.2	4.41	2.17	152.20
17	62.6	0.568	0.2789	19.605	55	131.0	4.63	2.27	159.72
18	64.4	0.605	0.2970	20.883	56	132.8	4.85	2.39	167.55
19	66.2	0.644	0.3162	22.229	57	134.6	5.09	2.50	175.72
20	68.0	0.685	0.3363	23.643	58	136.4	5.33	2.62	184.23
21	69.8	0.728	0.3577	25.152	59	138.2	5.59	2.75	193.08
22	71.6	0.774	0.3802	26.729	60	140.0	5.86	2.88	202.29
23	73.4	0.822	0.4040	28.401	61	141.8	6.14	3.01	211.87
24	75.2	0.873	0.4289	30.155	62	143.6	6.42	3.16	221.84
25	77.0	0.927	0.4554	32.018	63	145.4	6.72	3.30	232.20
26	78.8	0.984	0.4833	33.975	64	147.2	7.04	3.46	242.97
27	80.6	1.044	0.5126	36.042	65	149.0	7.36	3.62	254.17
28	82.4	1.106	0.5434	38.204	66	150.8	7.70	3.78	265.79
29	84.2	1.172	0.5759	40.488	67	152.6	8.05	3.95	277.87
30	86.0	1.242	0.6101	42.894	68	154.4	8.41	4.13	290.40
31	87.8	1.315	0.6461	45.423	69	156.2	8.79	4.32	303.41
32	89.6	1.392	0.6838	48.074	70	158.0	9.18	4.51	316.90
33	91.4	1.473	0.7234	50.861	71	159.8	9.58	4.71	330.90
34	93.2	1.558	0.7655	53.798	72	161.6	10.00	4.91	345.42
35	95.0	1.647	0.810	56.870	73	163.4	10.44	5.12	360.49
36	96.8	1.740	0.855	60.093	74	165.2	10.89	5.35	376.08
37	98.6	1.838	0.903	63.478	75	167.0	11.36	5.58	392.26

°C.	°F.	Inches of Mercury.	Pounds per sq. inch.	Grams per sq. Centimeter.	°C.	°F.	Atmospheres.	Pounds per sq. inch.	Grams per sq. Centimeter.
76	168.8	11.84	5.82	409.01	117	242.6	1.782	26.20	1841.74
77	170.6	12.35	6.06	426.36	118	244.4	1.841	27.06	1902.05
78	172.4	12.87	6.32	444.32	119	246.2	1.901	27.94	1963.95
79	174.2	13.40	6.58	462.92	120	248.0	1.962	28.85	2027.48
80	176.0	13.96	6.85	482.15	121	249.8	2.025	29.78	2092.70
81	177.8	14.54	7.14	502.07	122	251.6	2.091	30.73	2159.62
82	179.6	15.14	7.44	522.67	123	253.4	2.157	31.70	2228.26
83	181.4	15.75	7.74	543.96	124	255.2	2.225	32.70	2298.69
84	183.2	16.39	8.05	565.99	125	257.0	2.295	33.72	2370.91
85	185.0	17.05	8.37	588.74	126	258.8	2.366	34.78	2444.96
86	186.8	17.73	8.71	612.26	127	260.6	2.430	35.86	2520.89
87	188.6	18.43	9.05	636.57	128	262.4	2.515	36.97	2598.76
88	190.4	19.16	9.41	661.68	129	264.2	2.592	38.11	2678.54
89	192.2	19.91	9.78	687.61	130	266.0	2.671	39.26	2760.29
90	194.0	20.69	10.16	714.38	131	267.8	2.753	40.47	2844.12
91	195.8	21.49	10.56	740.31	132	269.6	2.836	41.68	2929.89
92	197.6	22.31	10.95	770.54	133	271.4	2.921	42.93	3017.80
93	199.4	23.17	11.38	799.98	134	273.2	3.008	44.21	3107.85
94	201.2	24.04	11.81	830.34	135	275.0	3.097	45.52	3200.04
95	203.0	24.95	12.26	861.66	136	276.8	3.188	46.87	3294.43
96	204.8	25.89	12.71	893.97	137	278.6	3.282	48.24	3391.06
97	206.6	26.85	13.19	927.26	138	280.4	3.378	49.65	3489.99
98	208.4	27.85	13.68	961.59	139	282.2	3.476	51.06	3591.29
99	210.2	28.87	14.18	996.98	140	284.0	3.576	52.55	3694.78
100	212.0	29.92 1.000*	14.70	1033.26	141	285.8	3.678	54.07	3800.75
					142	287.6	3.783	55.60	3909.14
101	213.8	1.036*	15.23	1070.78	143	289.4	3.890	57.16	4020.03
102	215.6	1.074*	15.79	1109.41	144	291.2	4.000	58.79	4133.42
103	217.4	1.112*	16.35	1149.21	145	293.0	4.113	60.44	4249.37
104	219.2	1.152*	16.94	1190.17	146	294.8	4.227	62.13	4367.91
105	221.0	1.193*	17.53	1232.32	147	296.6	4.344	63.86	4489.09
106	222.8	1.235*	18.15	1275.69	148	298.4	4.464	65.62	4612.96
107	224.6	1.278*	18.78	1320.32	149	300.2	4.587	67.41	4739.55
108	226.4	1.322*	19.44	1366.24	150	302.0	4.712	69.26	4868.9
109	228.2	1.368*	20.11	1413.47	151	303.8	4.840	71.14	5001.1
110	230.0	1.415*	20.80	1462.03	152	305.6	4.971	73.06	5136.1
111	231.8	1.463*	21.51	1511.97	153	307.4	5.104	75.02	5275.0
112	233.6	1.513*	22.24	1563.26	154	309.2	5.240	77.03	5414.8
113	235.4	1.564*	22.99	1615.99	155	311.0	5.380	79.07	5558.6
114	237.2	1.616*	23.76	1670.18	156	312.8	5.522	81.22	5705 5
115	239.0	1.670*	24.55	1725.84	157	314.6	5.667	83.29	5855.5
116	240.8	1.726*	25.73	1783.02	158	316.4	5.815	85.47	6008.5

* Atmospheres.

°C.	°F.	Atmospheres.	Pounds per sq. inch.	Grams per sq. Centimeter.	°C.	°F.	Atmospheres.	Pounds per sq. inch.	Grams per sq. Centimeter.
159	318.2	5.966	87.69	6164.7	195	383.0	13.842	203.43	14302.7
160	320.0	6.120	89.96	6324.2	196	384.8	14.139	207.81	14609.8
161	321.8	6.278	92.27	6486.8	197	386.6	14.441	212.25	14921.2
162	323.6	6.439	94.63	6652.8	198	388.4	14.749	216.77	15240.4
163	325.4	6.603	97.04	6822.2	199	390.2	15.062	221.37	15563.5
164	327.2	6.770	99.50	6994.9	200	392.0	15.380	226.04	15891.9
165	329.0	6.940	102.01	7171.1	201	393.8	15.703	230.79	16225.5
166	330.8	7.114	104.56	7350.7	202	395.6	16.031	235.61	16564.7
167	332.6	7.291	107.18	7533.9	203	397.4	16.364	240.54	16908.8
168	334.4	7.472	109.84	7720.7	204	399.2	16.703	245.49	17257.3
169	336.2	7.656	112.53	7911.1	205	401.0	17.047	250.53	17614.0
170	338.0	7.844	115.29	8105.2	206	402.8	17.396	255.67	17974.9
171	339.8	8.036	118.11	8303.1	207	404.6	17.751	260.88	18341.5
172	341.6	8.231	120.98	8504.7	208	406.4	18.111	266.18	18713.7
173	343.4	8.430	123.90	8710.2	209	408.2	18.477	271.55	19091.6
174	345.2	8.632	126.87	8919.5	210	410.0	18.848	277.01	19475.4
175	347.0	8.839	129.91	9132.8	211	411.8	19.226	282.58	19864.9
176	348.8	9.049	133.00	9350.0	212	413.6	19.608	288.21	20260.5
177	350.6	9.263	136.15	9571.3	213	415.4	19.997	293.92	20661.9
178	352.4	9.481	139.35	9796.6	214	417.2	20.391	299.72	21069.3
179	354.2	9.703	142.62	10026.1	215	419.0	20.791	305.57	21482.8
180	356.0	9.929	145.93	10259.7	216	420.8	21.197	311.57	21902.4
181	357.8	10.150	149.32	10497.7	217	422.6	21.690	317.62	22328.3
182	359.6	10.394	152.77	10739.9	218	424.4	22.027	323.78	22760.3
183	361.4	10.633	156.32	10986.4	219	426.2	22.452	330.01	23198.6
184	363.2	10.876	159.84	11237.3	220	428.0	22.882	336.30	23643.2
185	365.0	11.123	163.47	11490.0	221	429.8	23.319	342.70	24094.3
186	366.8	11.374	167.17	11752.5	222	431.6	23.761	349.21	24551.8
187	368.6	11.630	170.94	12016.9	223	433.4	24.210	355.81	25015.8
188	370.4	11.885	174.76	12285.9	224	435.2	24.666	362.50	25486.4
189	372.2	12.155	178.65	12559.6	225	437.0	25.128	369.29	25963.5
190	374.0	12.425	182.61	12837.9	226	438.8	25.596	376.17	26447.4
191	375.8	12.699	186.63	13121.0	227	440.6	26.071	383.15	26938.0
192	377.6	12.977	190.72	13408.9	228	442.4	26.552	390.22	27435.4
193	379.4	13.261	194.88	13701.7	229	444.2	27.040	397.40	27939.6
194	381.2	13.549	199.13	13999.4					

XCV. — Boiling Point of Water at Barometric Pressures of 680 MM. to 800 MM.

According to Regnault, Broch, and Wiebe

Barometric Pressure mm.	Boiling Point °C.	Barometric Pressure mm.	Boiling Point °C.	Barometric Pressure mm.	Boiling Point °C.	Barometric Pressure mm.	Boiling Point °C.
680	96.915	711	98.145	741	99.293	771	100.403
681	96.955	712	98.184	742	99.331	772	100.439
682	96.996	713	98.223	743	99.368	773	100.475
683	97.036	714	98.261	744	99.406	774	100.511
684	97.076	715	98.300	745	99.443	775	100.548
685	97.116	716	98.339	746	99.481	776	100.584
686	97.156	717	98.378	747	99.518	777	100.620
687	97.197	718	98.416	748	99.555	778	100.656
688	97.237	719	98.455	749	99.592	779	100.692
689	97.277	720	98.493	750	99.630	780	100.728
690	97.317	721	98.532	751	99.667	781	100.764
691	97.357	722	98.570	752	99.704	782	100.800
692	97.396	723	98.609	753	99.741	783	100.836
693	97.436	724	98.647	754	99.778	784	100.872
694	97.476	725	98.686	755	99.815	785	100.908
695	97.516	726	98.724	756	99.852	786	100.944
696	97.555	727	98.762	757	99.889	787	100.979
697	97.595	728	98.800	758	99.926	788	101.015
698	97.635	729	98.838	759	99.963	789	101.051
699	97.674	730	98.877	760	100.000	790	101.087
700	97.714	731	98.915	761	100.037	791	101.122
701	97.753	732	98.953	762	100.074	792	101.158
702	97.792	733	98.991	763	100.110	793	101.193
703	97.832	734	99.029	764	100.147	794	101.229
704	97.871	735	99.067	765	100.184	795	101.264
705	97.910	736	99.104	766	100.220	796	101.300
706	97.949	737	99.142	767	100.257	797	101.335
707	97.989	738	99.180	768	100.293	798	101.370
708	98.028	739	99.218	769	100.330	799	101.406
709	98.067	740	99.255	770	100.366	800	101.441
710	98.106						

XCVI. — Vapor Tension of Mercury

Ramsay and Young, J. Chem. Soc. **49,** 37 ; 1886

°C.	mm.	°C.	mm.	°C.	mm.	°C.	mm.
40	0.0008	160	4.013	280	157.378	400	1495.60
50	0.015	170	5.904	290	198.982	410	1733.79
60	0.029	180	8.535	300	246.704	420	2000.21
70	0.052	190	12.137	310	304.794	430	2298.80
80	0.092	200	17.015	320	373.528	440	2628.79
90	0.160	210	23.482	330	454.277	450	2996.06
100	0.270	220	31.957	340	546.715	460	3399.50
110	0.445	230	42.919	350	658.515	470	3843.68
120	0.719	240	56.919	360	785.107	480	4327.14
130	1.137	250	74.592	370	930.335	490	4856.74
140	1.763	260	96.661	380	1096.22	500	5434.99
150	2.684	270	123.905	390	1283.71	510	6059.16
						520	6736.60

XCVII. — Vapor Tension of Mercury

Cailletet, Corlardeau, and Rivière, C. R. **130,** 1585; 1900

°C.	Atm.	°C.	Atm.	°C.	Atm.	°C.	Atm.
400	2.1	550	13.8	700	50	850	137.5
450	4.25	600	22.3	750	72	880	162
500	8	650	34	800	102		

EQUIVALENTS OF METRIC AND CUSTOMARY (U. S.) WEIGHTS AND MEASURES

STANDARDS OF WEIGHTS AND MEASURES *

By the concurrent action of the principal governments of the world an International Bureau of Weights and Measures has been established near Paris. Under the direction of the International Committee, two ingots were cast of pure platinum-iridium in the proportion of nine parts of the former to one of the latter metal. From one of these a certain number of kilograms were prepared, from the other a definite number of meter bars. These standards of weight and length were intercompared, without preference, and certain ones were selected as International prototype standards. The others were distributed by lot, in September, 1887, to the different governments, and are called National Prototype Standards. Those apportioned to the United States were received in 1890, and are kept by the Bureau of Standards in Washington, D. C.

The International Standard Meter is defined by the distance between two lines at 0° Centigrade, on a platinum-iridium bar deposited at the International Bureau of Weights and Measures near Paris, France.

The International Standard Kilogram is a mass of platinum-iridium deposited at the same place, and its weight in vacuo is the same as that of the Kilogramme des Archives.

The International Standard Meter and Kilogram are the fundamental standards for the United States.

The liter is equal to a cubic decimeter, and it is measured by the quantity of distilled water which, at its maximum density, will counterpoise the standard kilogram in a vacuum, the volume of such a quantity of water being, as nearly as has been ascertained, equal to a cubic decimeter.

The grain Troy is the same as the grain Avoirdupois, and the pound Avoirdupois in use in the United States is equal to the British pound Avoirdupois.

The nautical mile adopted by the U. S. Coast and Geodetic Survey many years ago is defined as the length of a minute of arc of a great circle of a sphere whose surface equals that of the earth (Clarke's Spheroid of 1866).

* Quoted from Smithsonian Physical Tables, 3d Ed., 1904.

XCVIII. — Fundamental Equivalents *

1 meter	= 39.37 inches (law of July 28, 1866).
1 yard	= $\frac{3600}{3937}$ meter.
1 pound avoirdupois	= 453.5924277 grams.
1 pound troy	= $\frac{5760}{7000}$ pound avoirdupois.
1 gallon	= 231 cubic inches.
1 bushel	= 2,150.42 cubic inches.

All lengths, areas, and cubic measures are derived from the international meter, the legal equivalent being 1 meter = 39.37 inches (law of July 28, 1866). In 1893 the United States Office of Standard Weights and Measures was authorized to derive the yard from the meter, using, for the purpose, the relation legalized in 1866, 1 yard equals $\frac{3600}{3937}$ meter, and the customary weights are likewise referred to the kilogram (executive order, approved April 5, 1893). This action fixes the values, inasmuch as the reference standards are as perfect and unalterable as it is possible for human skill to make them.

All capacities are based on the practical equivalent 1 cubic decimeter equals 1 liter. The decimeter is equal to 3.937 inches in accordance with the legal equivalent of the meter given above. The gallon referred to in the tables is the United States gallon of 231 cubic inches. The bushel is the United States bushel of 2,150.42 cubic inches. These units must not be confused with the British units of the same name which differ from those used in the United States. The British gallon is approximately 20 per cent larger and the British bushel 3 per cent larger than the corresponding units used in this country.

The customary weights derived from the international kilogram are based on the value 1 avoirdupois pound = 453.5924277 grams. This value is carried out farther than that given in the law, but is in accord with the latter as far as it is there given. The value of the troy pound is based upon the relation just mentioned and also the equivalent $\frac{5760}{7000}$ avoirdupois pound equals 1 troy pound.

* Quoted from Table of Equivalents, U. S. Bureau of Standards.

XCIX.—Comparison of Metric and Customary Units from 1 to 10*

LENGTHS

Inches.		Millimeters.	Inches.		Centimeters.	Feet.		Meters.
0.03937	=	**1**	0.3937	=	**1**	**1**	=	0.304801
0.07874	=	**2**	0.7874	=	**2**	**2**	=	0.609601
0.11811	=	**3**	**1**	=	2.54001	**3**	=	0.914402
0.15748	=	**4**	1.1811	=	**3**	3.28083	=	**1**
0.19685	=	**5**	1.5748	=	**4**	**4**	=	1.219202
0.23622	=	**6**	1.9685	=	**5**	**5**	=	1.524003
0.27559	=	**7**	**2**	=	5.08001	**6**	=	1.828804
0.31496	=	**8**	2.3622	=	**6**	6.56167	=	**2**
0.35433	=	**9**	2.7559	=	**7**	**7**	=	2.133604
1	=	25.4001	**3**	=	7.62002	**8**	=	2.438405
2	=	50.8001	3.1496	=	**8**	**9**	=	2.743205
3	=	76.2002	3.5433	=	**9**	9.84250	=	**3**
4	=	101.6002	**4**	=	10.16002	13.12333	=	**4**
5	=	127.0003	**5**	=	12.70003	16.40417	=	**5**
6	=	152.4003	**6**	=	15.24003	19.68500	=	**6**
7	=	177.8004	**7**	=	17.78004	22.96583	=	**7**
8	=	203.2004	**8**	=	20.32004	26.24667	=	**8**
9	=	228.6005	**9**	=	22.86005	29.52750	=	**9**

U. S. Yards.		Meters.	U. S. Miles.		Kilometers.
1	=	0.914402	0.62137	=	**1**
1.093611	=	**1**	**1**	=	1.60935
2	=	1.828804	1.24274	=	**2**
2.187222	=	**2**	1.86411	=	**3**
3	=	2.743205	**2**		3.21869
3.280833	=	**3**	2.48548	=	**4**
4	=	3.657607	**3**	=	4.82804
4.374444	=	**4**	3.10685	=	**5**
5	=	4.572009	3.72822	=	**6**
5.468056	=	**5**	**4**	=	6.43739
6	=	5.486411	4.34959	=	**7**
6.561667	=	**6**	4.97096	=	**8**
7	=	6.400813	**5**	=	8.04674
7.655278	=	**7**	5.59233	=	**9**
8	=	7.315215	**6**	=	9.65608
8.748889	=	**8**	**7**	=	11.26543
9	=	8.229616	**8**	=	12.87478
9.842500	=	**9**	**9**	=	14.48412

* Table of Equivalents, U. S. Bureau of Standards.

AREAS

Square Inches.		Square Millimeters.	Square Inches.		Square Centimeters.	Square Feet.		Square Meters.
0.00155	=	1	0.1550	=	1	1	=	0.09290
0.00310	=	2	0.3100	=	2	2	=	0.18581
0.00465	=	3	0.4650	=	3	3	=	0.27871
0.00620	=	4	0.6200	=	4	4	=	0.37161
0.00775	=	5	0.7750	=	5	5	=	0.46452
0.00930	=	6	0.9300	=	6	6	=	0.55742
0.01085	=	7	1	=	6.452	7	=	0.65032
0.01240	=	8	1.0850	=	7	8	=	0.74323
0.01395	=	9	1.2400	=	8	9	=	0.83613
1	=	645.16	1.3950	=	9	10.764	=	1
2	=	1,290.33	2	=	12.903	21.528	=	2
3	=	1,935.49	3	=	19.355	32.292	=	3
4	=	2,580.65	4	=	25.807	43.055	=	4
5	=	3,225.81	5	=	32.258	53.819	=	5
6	=	3,870.98	6	=	38.710	64.583	=	6
7	=	4,516.14	7	=	45.161	75.347	=	7
8	=	5,161.30	8	=	51.613	86.111	=	8
9	=	5,806.46	9	=	58.065	96.875	=	9

Square Yards.		Square Meters.	Square Miles.		Square Kilometers.	Acres.		Hectares.
1	=	0.8361	0.3861	=	1	1	=	0.4047
1.1960	=	1	0.7722	=	2	2	=	0.8094
2	=	1.6723	1	=	2.5900	2.471	=	1
2.3920	=	2	1.1583	=	3	3	=	1.2141
3	=	2.5084	1.5444	=	4	4	=	1.6187
3.5880	=	3	1.9305	=	5	4.942	=	2
4	=	3.3445	2	=	5.1800	5	=	2.0234
4.7839	=	4	2.3166	=	6	6	=	2.4281
5	=	4.1807	2.7027	=	7	7	=	2.8328
5.9799	=	5	3	=	7.7700	7.413	=	3
6	=	5.0168	3.0888	=	8	8	=	3.2375
7	=	5.8529	3.4749	=	9	9	=	3.6422
7.1759	=	6	4	=	10.3600	9.884	=	4
8	=	6.6890	5	=	12.9500	12.355	=	5
8.3719	=	7	6	=	15.5400	14.826	=	6
9	=	7.5252	7	=	18.1300	17.297	=	7
9.5679	=	8	8	=	20.7200	19.768	=	8
10.7639	=	9	9	=	23.3100	22.239	=	9

VOLUMES

Cubic Inches.		Cubic Millimeters.	Cubic Inches.		Cubic Centimeters.	Cubic Feet.		Cubic Meters.
0.000061	=	**1**	0.0610	=	**1**	**1**	=	0.02832
0.000122	=	**2**	0.1220	=	**2**	**2**	=	0.05663
0.000183	=	**3**	0.1831	=	**3**	**3**	=	0.08495
0.000244	=	**4**	0.2441	=	**4**	**4**	=	0.11327
0.000305	=	**5**	0.3051	=	**5**	**5**	=	0.14159
0.000366	=	**6**	0.3661	=	**6**	**6**	=	0.16990
0.000427	=	**7**	0.4272	=	**7**	**7**	=	0.19822
0.000488	=	**8**	0.4882	=	**8**	**8**	=	0.22654
0.000549	=	**9**	0.5492	=	**9**	**9**	=	0.25485
1	=	16,387.2	**1**	=	16.3872	35.314	=	**1**
2	=	32,774.3	**2**	=	32.7743	70.629	=	**2**
3	=	49,161.5	**3**	=	49.1615	105.943	=	**3**
4	=	65,548.6	**4**	=	65.5486	141.258	=	**4**
5	=	81,935.8	**5**	=	81.9358	176.572	=	**5**
6	=	98,323.0	**6**	=	98.3230	211.887	=	**6**
7	=	114,710.1	**7**	=	114.7101	247.201	=	**7**
8	=	131,097.3	**8**	=	131.0973	282.516	=	**8**
9	=	147,484.5	**9**	=	147.4845	317.830	=	**9**

Cubic Yards.		Cubic Meters.	Cubic Yards.		Cubic Meters.	Cubic Yards.		Cubic Meters.
1	=	0.7645	**4**	=	3.0582	7.8477	=	**6**
1.3079	=	**1**	**5**	=	3.8228	**8**	=	6.1165
2	=	1.5291	5.2318	=	**4**	**9**	=	6.8810
2.6159	=	**2**	**6**	=	4.5874	9.1556	=	**7**
3	=	2.2937	6.5397	=	**5**	10.4635	=	**8**
3.9238	=	**3**	**7**	=	5.3519	11.7715	=	**9**

CAPACITIES

Milliliters. (cc.)		U.S. Liquid Ounces.
1	=	0.03381
2	=	0.06763
3	=	0.10144
4	=	0.13526
5	=	0.16907
6	=	0.20288
7	=	0.23670
8	=	0.27051
9	=	0.30432
29.574	=	**1**
59.147	=	**2**
88.721	=	**3**
118.295	=	**4**
147.869	=	**5**
177.442	=	**6**
207.016	=	**7**
236.590	=	**8**
266.163	=	**9**

Milliliters. (cc.)		U.S. Apothecaries' Drams.
1	=	0.2705
2	=	0.5410
3	=	0.8115
3.6967	=	**1**
4	=	1.0820
5	=	1.3525
6	=	1.6231
7	=	1.8936
7.3934	=	**2**
8	=	2.1641
9	=	2.4346
11.0901	=	**3**
14.7869	=	**4**
18.4836	=	**5**
22.1803	=	**6**
25.8770	=	**7**
29.5737	=	**8**
33.2704	=	**9**

U.S. Apothecaries' Scruples.		Milliliters. (cc.)
0.8115	=	**1**
1	=	1.2322
1.6231	=	**2**
2	=	2.4645
2.4346	=	**3**
3	=	3.6967
3.2461	=	**4**
4	=	4.9290
4.0577	=	**5**
4.8692	=	**6**
5	=	6.1612
5.6807	=	**7**
6	=	7.3934
6.4923	=	**8**
7	=	8.6257
7.3038	=	**9**
8	=	9.8579
9	=	11.0901

U.S. Liquid Quarts.		Liters.
1	=	0.94636
1.05668	=	**1**
2	=	1.89272
2.11336	=	**2**
3	=	2.83908
3.17005	=	**3**
4	=	3.78543
4.22673	=	**4**
5	=	4.73179
5.28341	=	**5**
6	=	5.67815
6.34009	=	**6**
7	=	6.62451
7.39677	=	**7**
8	=	7.57088
8.45345	=	**8**
9	=	8.51723
9.51014	=	**9**

U.S. Liquid Gallons.		Liters.
0.26417	=	**1**
0.52834	=	**2**
0.79251	=	**3**
1	=	3.78543
1.05668	=	**4**
1.32085	=	**5**
1.58502	=	**6**
1.84919	=	**7**
2	=	7.57087
2.11336	=	**8**
2.37753	=	**9**
3	=	11.35630
4	=	15.14174
5	=	18.92717
6	=	22.71261
7	=	26.49804
8	=	30.28348
9	=	34.06891

U.S. Dry Quarts.		Liters.
0.9081	=	**1**
1	=	1.1012
1.8162	=	**2**
2	=	2.2025
2.7242	=	**3**
3	=	3.3037
3.6323	=	**4**
4	=	4.4049
4.5404	=	**5**
5	=	5.5061
5.4485	=	**6**
6	=	6.6074
6.3565	=	**7**
7	=	7.7086
7.2646	=	**8**
8	=	8.8098
8.1727	=	**9**
9	=	9.9110

CAPACITIES (*Continued*).

U.S. Pecks.		Liters.	Dekaliters.		U.S. Pecks.	U.S. Bushels.		Hectoliters.
0.11351	=	1	0.8810	=	1	1	=	0.35239
0.22702	=	2	1	=	1.1351	2	=	0.70479
0.34053	=	3	1.7620	=	2	2.83774	=	1
0.45404	=	4	2	=	2.2702	3	=	1.05718
0.56755	=	5	2.6429	=	3	4	=	1.40957
0.68106	=	6	3	=	3.4053	5	=	1.76196
0.79457	=	7	3.5239	=	4	5.67548	=	2
0.90808	=	8	4	=	4.5404	6	=	2.11436
1	=	8.80982	4.4049	=	5	7	=	2.46675
1.02157	=	9	5	=	5.6755	8	=	2.81914
2	=	17.61964	5.2859	=	6	8.51323	=	3
3	=	26.42946	6	=	6.8106	9	=	3.17154
4	=	35.23928	6.1669	=	7	11.35097	=	4
5	=	44.04910	7	=	7.9457	14.18871	=	5
6	=	52.85892	7.0479	=	8	17.02645	=	6
7	=	61.66874	7.9288	=	9	19.86420	=	7
8	=	70.47856	8	=	9.0808	22.70194	=	8
9	=	79.28838	9	=	10.2159	25.53968	=	9

U.S. Bushels per Acre.		Hectoliters per Hectar.	U.S. Bushels per Acre.		Hectoliters per Hectar.	U.S. Bushels per Acre.		Hectoliters per Hectar.
1	=	0.87078	4	=	3.48311	7	=	6.09545
1.14840	=	1	4.59359	=	4	8	=	6.96622
2	=	1.74156	5	=	4.35389	8.03879	=	7
2.29680	=	2	5.74199	=	5	9	=	7.83700
3	=	2.61233	6	=	5.22467	9.18719	=	8
3.44519	=	3	6.89039	=	6	10.33558	=	9

MASSES

Grains.		Grams.	Avoirdupois Ounces.		Grams.	Troy Ounces.		Grams.
1	=	0.06480	0.03527	=	1	0.03215	=	1
2	=	0.12960	0.07055	=	2	0.06430	=	2
3	=	0.19440	0.10582	=	3	0.09645	=	3
4	=	0.25920	0.14110	=	4	0.12860	=	4
5	=	0.32399	0.17637	=	5	0.16075	=	5
6	=	0.38879	0.21164	=	6	0.19290	=	6
7	=	0.45359	0.24692	=	7	0.22506	=	7
8	=	0.51839	0.28219	=	8	0.25721	=	8
9	=	0.58319	0.31747	=	9	0.28936	=	9
15.4324	=	1	1	=	28.3495	1	=	31.10348
30.8647	=	2	2	=	56.6991	2	=	62.20696
46.2971	=	3	3	=	85.0486	3	=	93.31044
61.7294	=	4	4	=	113.3981	4	=	124.41392
77.1618	=	5	5	=	141.7476	5	=	155.51740
92.5941	=	6	6	=	170.0972	6	=	186.62088
108.0265	=	7	7	=	198.4467	7	=	217.72437
123.4589	=	8	8	=	226.7962	8	=	248.82785
138.8912	=	9	9	=	255.1457	9	=	279.93133

Avoirdupois Pounds.		Kilograms.	Troy Pounds.		Kilograms.
1	=	0.45359	1	=	0.37324
2	=	0.90718	2	=	0.74648
2.20462	=	1	2.67923	=	1
3	=	1.36078	3	=	1.11973
4	=	1.81437	4	=	1.49279
4.40924	=	2	5	=	1.86621
5	=	2.26796	5.35846	=	2
6	=	2.72155	6	=	2.23945
6.61387	=	3	7	=	2.61269
7	=	3.17515	8	=	2.98593
8	=	3.62874	8.03769	=	3
8.81849	=	4	9	=	3.35918
9	=	4.08233	10.71691	=	4
11.02311	=	5	13.39614	=	5
13.22773	=	6	16.07537	=	6
15.43236	=	7	18.75460	=	7
17.63698	=	8	21.43383	=	8
19.84160	=	9	24.11306	=	9

EQUIVALENTS OF METRIC AND BRITISH IMPERIAL WEIGHTS AND MEASURES*

STANDARDS AND FUNDAMENTAL EQUIVALENTS

The meter is the length, at the temperature of 0° C., of the platinum-iridium bar deposited with the Board of Trade.

The present legal equivalent of the meter is 39.37079 inches. If a brass meter is, however, compared, not at its legal temperature (0° C. or 32° F.), but at the temperature of 62° F., with a brass yard also at the temperature of 62° F., then the apparent equivalent of the meter would be nearly 39.382 inches.

The kilogram is the weight in vacuo at 0° C. of the platinum-iridium weight deposited with the Board of Trade.

The liter contains one kilogram weight of distilled water at its maximum density (4° C.), the barometer being at 760 millimeters.

C. — Metric to Imperial

Linear Measure

millimeter (mm., .001 m.)	=	0.03937 inch
centimeter (.01 m.)	=	0.39371 inch
decimeter (.1 m.)	=	3.93708 inches
meter (m.)	=	39.37079 inches
	=	3.28089917 feet
	=	1.09363306 yards
dekameter (10 m.)	=	10.93633 yards
hectometer (100 m.)	=	109.36331 yards
kilometer (1,000 m.)	=	0.62138 mile
myriameter (10,000 m.)	=	6.21382 miles
micron	=	0.001 mm.

Square Measure

sq. centimeter	=	0.15501 sq. inch
sq. decimeter (100 sq. centm.)	=	15.50059 sq. inches
sq. meter or centiare (100 sq. dcm.)	=	10.76430 sq. feet
	=	1.19603 sq. yards
are (100 sq. m.)	=	119.60333 sq. yards
hectare (100 ares or 10,000 sq. m.)	=	2.47115 acres

Cubic Measure

cub. centimeter (c.c. or 1,000 cubic millimeters)	=	0.06103 cub. inch
cub. decimeter (c.d. or 1,000 c.c.)	=	61.02705 cub. inches
cub. meter or stere (1,000 c.d.)	=	35.31658074 cu. feet
	=	1.30802151 cu. yards

*Quoted from sheets issued in 1890 by the Standard Office of the British Board of Trade.

MEASURE OF CAPACITY

milliliter (ml., c.c. or .001 liter)	= 0.06103 cub. inch
centiliter (.01 liter)	= 0.61027 " "
	= 0.07043 gill
deciliter (.1 liter)	= 0.17608 pint
liter (1,000 c.c. or cub. decimeter)	= 1.76077 pints
dekaliter (10 liters)	= 2.20097 gallons
hectoliter (100 liters)	= 2.75121 bushels
kiloliter (1,000 liters)	= 3.43901 quarters
microliter	= 0.001 c.c.

APOTHECARIES' MEASURE

cubic centimeter (1 gram weight of water)	= 0.03527 fluid ounce
	= 0.28219 fluid drachm
	= 15.43235 grains weight
cubic millimeter	= 0.01693 minim

AVOIRDUPOIS WEIGHT

milligram (mgr.)	= 0.01543 grain
centigram (.01 gram)	= 0.5432 "
decigram (.1 gram)	= 1.54324 grains
gram	= 15.43235 "
dekagram (10 gram)	= 5.64383 drams
hectogram (100 gram)	= 3.52739 ounces
kilogram (1,000 gram)	= 2.20462125 pounds
	= 15432.34874 grains
myriagram (10 kilogram)	= 22.04621 pounds
quintal (100 kilogram)	= 1.96841 cwt.
millier or ton (1,000 kilogram)	= 0.98420591 ton

TROY WEIGHT

gram	= 0.03215073 oz. Troy
	= 0.64301 pennyweight
	= 15.43235 grains

APOTHECARIES' WEIGHT

gram	= 0.25721 drachm
	= 0.77162 scruple
	= 15.43235 grains

CI. — EQUIVALENTS OF BRITISH IMPERIAL AND METRIC WEIGHTS AND MEASURES

STANDARDS AND FUNDAMENTAL EQUIVALENTS

The yard is the length at 62° F. marked on a bronze bar deposited with the Board of Trade.

The pound is the weight of a piece of platinum weighed in vacuo at the temperature of 0° C., which is also deposited with the Board of Trade.

The gallon contains 10 lb. weight of distilled water at the temperature of 62° F., the barometer being at 30 inches. The weight of a cubic inch of water is 252.286 grains.

IMPERIAL TO METRIC

LINEAR MEASURE

inch	= 25.39954113 millimeters
foot (12 inches)	= 0.30479449 meters
yard (3 feet)	= 0.91438348 "
pole (5½ yards)	= 5.02911 "
chain (22 yards or 100 links)	= 20.11644 "
furlong (220 yards)	= 201.16437 "
mile (1,760 yards)	= 1.60931493 kilometers

SQUARE MEASURE

square inch	= 6.45137 sq. centimeters
square foot (144 sq. in.)	= 9.28997 sq. decimeters
sq. yard (9 sq. ft.)	= 0.83609715 sq. meters
perch (30¼ sq. yd.)	= 25.29194 " "
rood (40 perches)	= 10.11678 ares
acre (4,840 sq. yds.)	= 0.40467 hectare
sq. mile (640 acres)	= 258.98945312 hectares

CUBIC MEASURE

cubic inch	= 16.38617589 cub. centimeters
cubic foot (1,728 cub. in.)	= 0.02832 cub. meter
	= 28.31531 cub. decimeters
cubic yard (27 cub. ft.)	= 0.76451342 cub. meter

MEASURE OF CAPACITY

gill	= 141.983 cubic centimeters
	= 1.41983 deciliters
pint (4 gills)	= 0.56793 liter
quart (2 pints)	= 1.13586 liters
gallon (4 quarts)	= 4.54345797 liters
peck (2 gallons)	= 9.08692 "
bushel (8 gallons)	= 3.63477 dekaliters
quarter (8 bushels)	= 2.90781 hectoliters

APOTHECARIES' MEASURE

gallon * (8 pints or 160 fluid oz.)	= 4.54346 liters
fluid ounce f. ℥ (8 drachms)	= 28.39661 cub. centimeters
fluid drachm f. ʒ (16 minims)	= 3.54958 " "
minim, ♏ (0.91146 grain weight)	= 0.05916 " "

AVOIRDUPOIS WEIGHT

grain	= 64.79895036 milligrams
dram	= 1.77185 grams
ounce (16 drams)	= 28.34954 "
pound (16 oz. or 7,000 grains)	= 0.45359265 kilogram
stone (14 pounds)	= 6.35030 "
quarter (28 pounds)	= 12.70059 "
hundred weight (112 pounds)	= 50.80238 "
	= 0.50802 quintal
ton (20 cwt.)	= 1.01604754 millier or tonne

TROY WEIGHT

Troy ounce (480 grains † avoir.)	= 31.10350 grams
pennyweight (24 grains)	= 1.55517 "

APOTHECARIES' WEIGHT

ounce ‡ (8 drachms)	= 31.10350 grams
drachm ʒi (3 scruples)	= 3.88794 "
scruple ℈i (20 grains *)	= 1.29598 "

* The Apothecaries' gallon is of the same capacity as the Imperial gallon.

† The Troy grain is of the same weight as the Avoirdupois and Apothecaries' grain.

‡ The Apothecaries' ounce is of the same weight as the Troy ounce.

THERMOCHEMISTRY

CII. — Thermochemical Units

The Small Calorie is the amount of heat required to raise the temperature of one gram of water one degree centigrade (from 0° to 1°, 4° to 5° or 15° to 16° being used, giving slightly different values).

The Large Calorie is the amount of heat required to raise the temperature of one kilogram of water one degree centigrade. It is therefore one thousand times as large as the small calorie.

The British Thermal Unit (B. T. U.) is the heat required to raise the temperature of one pound of water one degree Fahrenheit. As one kilogram is equal to 2.20462 pounds, and one degree centigrade is equal to $\frac{9}{5}$ degree Fahrenheit, the large calorie is 3.96832 ($2.20462 \times \frac{9}{5}$) times as great as the British Thermal Unit, the small calorie being .00396832 times the British Thermal Unit.

The Heat of Combustion of a substance is the number of small or large calories of heat evolved during the combustion of a gram or a kilogram of the substance.

Using the English weights and measures it is the number of B. T. U. of heat evolved during the combustion of one pound of the substance. To convert the former into the latter value the number of calories must be multiplied by 1.8 ($3.96832 \div 2.20462$).

The Heat of Formation of a substance is the number of calories of heat evolved or absorbed when a gram molecular weight of the substance is formed. When heat is absorbed the value found is negative.

CIII. — Heats of Formation

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Aluminium				
carbide	Al_4, C_3	15	solid	232,000
chloride	Al, Cl_3	15	solid	161,800
"			dil. sol.	238,100
fluoride	Al, F_3	15	dil. sol.	275,220
hydroxide	Al, O_3, H_3	15	solid	301,300
oxide	Al_2, O_3	15	solid	392,600
silicate	Al_2, Si_2, O_7	15	solid	767,500
"	Al_2, Si_2, O_9, H_4	15	solid	927,420
sulphate	Al_2, S_3, O_{12}	15	dil. sol.	879,700
sulphide	Al_2, S_3	15	solid	126,400
Ammonia	N, H_3	15	gas	12,000
"			liquid	21,000
Ammonium				
bi-carbonate	N, H_5, C, O_3	15	solid	208,600
"			dil. sol.	202,300
bromide	NH_3, HBr			45,020
"	NH_4, Br			65,350
chloride	N, H_4, Cl	15	solid	76,800
"			dil. sol.	72,800
"	NH_3, HCl			41,900
"	NH_4, Cl			75,790
fluoride	N, H_4, F	15	solid	101,250
"			dil. sol.	99,750
hydroxide	N, H_5, O	15	solid	88,800
"			dil. sol.	90,000
iodide	NH_3, HI			43,460
"	NH_4, I			49,310
nitrate	N_2, H_4, O_3			88,060
nitrite	N_2, H_4, O_2			64,950
acid sulphate	N, H_5, S, O_4	15	solid	244,600
" "			dil. sol.	245,100
sulphate	N_2, H_8, S, O_4	15	solid	283,500
"			dil. sol.	281,100
sulphide	N, H_5, S	15	solid	40,000
"			dil. sol.	36,700
Antimony				
chloride, tri-	Sb, Cl_3	15	solid	91,400
" penta-	Sb, Cl_5	15	liquid	104,500
" "			solid	104,870
fluoride	Sb, F_3	15	dil. sol.	136,680

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Antimony				
hydride (stibine)	Sb, H_3	15	gas	86,800
"			const. vol.	34,270
"			const. press.	33,980
oxide, tri-	Sb_2, O_3	15	solid	166,900
" pent-	Sb_2, O_5	15	solid	231,200
sulphide	Sb_2, S_3	15	solid	34,400
Arsenic				
chloride	As, Cl_3		liquid	71,380
"		15	solid	−71,500
hydride (arsine)	H_3, As	15	gas	44,200
oxide tri-	As_2, O_3	15	solid	154,670 / 156,400
" "			dil. sol.	148,900
" pent-	As_2, O_5	15	solid	219,400
" "			dil. sol.	225,400
Auric				
chloride	Au, Cl_3	15	solid	22,800
"			dil. sol.	27,200
oxide	Au_2, O_3	15	solid	−11,500
Aurous chloride	Au, Cl	15	solid	5,800
Barium				
carbonate	Ba, C, O_3	15	solid	286,300
chloride	Ba, Cl_2	15	solid	197,100
"			dil. sol.	198,300
fluoride	Ba, F_2	15	solid	224,000
"			dil. sol.	221,500
hydride	Ba, H_2	15	solid	37,500
hydroxide	$\frac{Ba}{2}$, O, H			109,550
nitride	Ba_3, N_2	15	solid	149,400
oxide	Ba, O	15	solid	133,400
"			dil. sol.	161,500
dioxide	Ba, O_2	15	solid	145,500
selenide	Ba, Se	15	solid	69,900
silicate	Ba, Si, O_3	15	solid	328,100
sulphate	Ba, S, O_4	15	solid	339,400
sulphide	Ba, S	15	solid	102,900
"			dil. sol.	109,800
Beryllium				
chloride	Be, Cl_2	15	solid	155,000
"			dil. sol.	199,500

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Bismuth				
chloride	Bi, Cl_3		solid	90,800
hydroxide	Bi, O_3, H_3		solid	171,700
oxide	Bi_2, O_3		solid	139,200
Boron				
chloride	B, Cl_3	15	gas	89,100
fluoride	B, F_3	15	dil. sol.	219,345
oxide	B_2, O_3	15	solid	272,600
"			dil. sol.	279,900
sulphide	B_2, S_3	15	solid	75,800
Cadmium				
carbonate	Cd, C, O_3	15	solid	183,200
chloride	Cd, Cl_2	15	solid	93,700
"			dil. sol.	96,400
cyanide	Cd, C_2, N_2	15	solid	−31,850
fluoride	Cd, F_2	15	dil. sol.	121,720
oxide	Cd, O	15	solid	66,300
sulphate	Cd, S, O_4	15	solid	219,900
"			dil. sol.	231,600
sulphide	Cd, S	15	solid	34,400
telluride	Cd, Te	15	solid	16,600
Cæsium				
carbonate	Cs_2O, CO_2			20,570
"	Cs_2, C, O_3			274,540
carbonate, bi-	Cs, H, C, O_3			232,920
"	$CsOH, CO_2$			11,250
chloride	Cs, Cl			109,860
hydroxide	Cs_2O, H_2O			50,360
oxide mon-	Cs_2, O			82,700
" tri-	Cs_2O_2, O			18,000
" tetr-	Cs_2O_3, O			12,500
Calcium				
aluminate, mono-	Ca, Al_2, O_4	15	solid	524,550
" di-	Ca_2, Al_2, O_5	15	solid	658,900
" tri-	Ca_3, Al_2, O_6	15	solid	789,050
aluminium silicate	Ca_3, Al_2, Si_2, O_{10}	15	solid	1,195,550
carbide	Ca, C_2	15	solid	−6,250
carbonate	Ca, C, O_3	15	solid	273,850
chloride	Ca, Cl_2	15	solid	169,900
"			dil. sol.	187,400
cyanide	Ca, C_2, N_2	15	dil. sol.	41,650
fluoride	Ca, F_2	15	solid	216,450

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Calcium				
hydroxide	Ca, H_2, O_2	15	solid	215,600
"			dil. sol.	219,500
"	CaO, H_2O			15,100
oxide	Ca, O	15	solid	131,500
"			dil. sol.	149,600
" per-	Ca, O_2			156,010
phosphate	Ca_3, P_2, O_8	15	solid	919,200
selenide	Ca, Se	15	solid	58,000
silicate, mono-	Ca, Si, O_3	15	solid	329,350
" di-	Ca, Si, O_4	15	solid	471,300
" tri-	Ca_3, Si, O_5	15	solid	603,050
sulphate	Ca, S, O_4	15	solid	317,400
"			dil. sol.	321,800
sulphide	Ca, S	15	solid	94,300
"			dil. sol.	100,600
Carbon				
di-oxide	CO, O	15	gas	68,040
"			dil. sol.	73,940
"	C, O_2	15	gas	103,100
di-sulphide	C, S_2	15	gas	−25,400
"			liquid	−19,000
monoxide	C, O	15	gas	21,160
tetrachloride	C, Cl_4		liquid	28,230
"			gaseous	21,030
Cementite	C, 3 Fe			8,940 (650°–700°)
Cobalt				
chloride	Co, Cl_2	15	solid	76,700
"			dil. sol.	95,000
fluoride	Co, F_2	15	dil. sol.	120,340
oxide	Co, O	15	solid	64,100
selenide	Co, Se	15	solid	13,900
sulphate	Co, S, O_4	15	dil. sol.	228,700
sulphide	Co, S	15	solid	21,900
telluride	Co, Te	15	solid	13,000
Copper				
carbonate	Cu, C, O_3	15	solid	146,100
chloride (cupric)	Cu, Cl_2	15	solid	51,400
" "			dil. sol.	62,500
" (cuprous)	Cu, Cl	15	solid	35,400
cyanide	Cu, C, N	15	solid	−20,235
nitrate	Cu, N_2, O_6	15	dil. sol.	81,300

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Copper				
oxide (cupric)	Cu, O	15	solid	37,700
" (cuprous)	Cu_2O	15	solid	43,800
selenide (cupric)	Cu, Se	15	solid	17,300
" (cuprous)	Cu_2, Se	15	solid	8,000
sulphate	Cu, S, O_4	15	solid	181,700
"			dil. sol.	197,500
sulphide (cupric)	Cu, S	15	solid	10,100
" (cuprous)	Cu_2, S	15	solid	20,300
telluride	Cu_2, Te	15	solid	8,200
Cyanogen	C, N		gas	−65,700
Hydriodic acid	H, I		gas	−6,040
Hydrobromic acid	H, Br		gas	8,440
Hydrochloric acid	H, Cl	15	gas	22,000
"			dil. sol.	39,400
Hydrocyanic acid	H, C, N	15	gas	−27,150
"			dil. sol.	−21,050
Hydroferricyanic acid	H_3, Fe, C_6N_6	15	dil. sol.	−127,500
Hydroferrocyanic acid	H_4, Fe, C_6N_6	15	solid	−102,000
"			dil. sol.	−101,500
Hydrofluoric acid	H, F	15	gas	38,500
"			dil. sol.	50,300
Hydrogen				
oxide	H_2, O		solid	70,400
"			liquid	69,000
"			gas	58,060
peroxide	H_2, O_2, Aq		liquid	45,300
"	H_2O, O, Aq			−23,060
" hydrated	H_2O_2Aq, H_2*			−91,420
sulphide	H_2, S	15	gas	4,800
"			dil. sol.	9,500
Hypochlorous anhydride	Cl_2, O		gas	−17,930
Iodic acid	H, I, O_3			57,590

* Decomposition of hydrogen peroxide.

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Iodine				
chloride mono-	I, Cl		liquid	5,830
" tri-	I, Cl_3		solid	21,490
pentoxide	I_2, O_5		solid	45,030
sulphide	I, S		solid	0,000
Iron				
carbide	Fe_3, C	15	solid	8,460
carbonate (ferrous)	Fe, C, O_3	15	solid	187,800
chloride (ferrous)	Fe, Cl_2	15	solid	82,200
" "			dil. sol.	100,100
chloride (ferric)	Fe, Cl_3	15	solid	96,150
" "				127,850
cyanide	Fe_7, C_{18}, N_{18}	15	solid	−256,700
fluoride (ferrous)	Fe, F_2	15	dil. sol.	125,220
fluoride (ferric)	Fe, F_3	15	dil. sol.	164,940
oxides	Fe, O	15	solid	65,700
"	Fe_2, O_3	15	solid	195,600
"	Fe_3O_4	15	solid	270,800
phosphide	Fe, P	15	solid	nearly zero
selenide	Fe, Se	15	solid	15,200
silicate (ferrous)	Fe, SiO_3	15	solid	254,600
sulphate (ferrous)	Fe, S, O_4	15	dil. sol.	234,900
" (ferric)	Fe_2, S_3, O_{12}	15	dil. sol.	650,500
sulphide	Fe, S	15	solid	24,000
telluride	Fe, Te	15	solid	12,000
Lanthanum				
chloride	La, Cl_3			263,000
Lead				
carbonate	Pb, C, O_3	15	solid	170,000
chloride	Pb, Cl_2	15	solid	83,900
"			dil. sol.	77,900
fluoride	Pb, F_2	15	solid	101,600
nitrate	Pb, N_2, O_6	15	solid	105,400
"			dil. sol.	98,200
oxide mon-	Pb, O	15	solid	50,800
" per-	Pb, O_2	15	solid	63,400
selenide	Pb, Se	15	solid	17,000
sulphate	Pb, S, O_4	15	solid	215,700
sulphide	Pb, S	15	solid	20,200
telluride	Pb, Te	15	solid	6,200
Lithium				
carbide	Li, C	15	solid	−5,750

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Lithium				
chloride	Li, Cl	15	solid	93,900
"			dil. sol.	102,300
fluoride	Li, F	15	dil. sol.	116,880
hydroxide	Li, O, H	15	solid	112,300
"			dil. sol.	118,100
"	Li_2O, H_2O		not condensed	22,270
"	Li_2O, H_2O		condensed	19,090
oxide	Li_2, O			143,320
selenide	Li_2, Se	15	solid	83,000
"			dil. sol.	93,700
silicate	Li_2Si, O_3	15	solid	347,100
sulphate	Li_2, S, O_4	15	solid	333,500
"			dil. sol.	339,600
sulphide	Li, S	15	dil. sol.	115,400
Magnesium				
carbonate	Mg, C, O_3	15	solid	269,900
chloride	Mg, Cl_2	15	solid	151,200
"			dil. sol.	187,100
fluoride	Mg, F_2	15	solid	209,500
hydroxide	Mg, O_2, H_2	15	solid	217,800
oxide	Mg, O	15	solid	143,400
"			dil. sol.	148,800
phosphate	Mg_3, P_2, O_8	15	solid	910,600
sulphate	Mg, S, O_4	15	solid	300,900
"			dil. sol.	321,100
sulphide	Mg, S	15	solid	79,400
Manganese				
carbide di-	Mn, C_2	15	solid	114,400
" tri-	Mn, C_3	15	solid	9,900
carbonate	Mn, C, O_3	15	solid	210,300
chloride	Mn, Cl_2	15	solid	151,200
"			dil. sol.	187,100
fluoride	Mn, F_2	15	solid	209,500
oxide (manganous)	Mn, O	15	solid	90,900
manganoso manganic	Mn_3, O_4	15	solid	328,000
dioxide	Mn, O_2	15	solid	125,300
phosphide	Mn_3, P_2	15	solid	70,900
selenide	Mn, Se	15	solid	22,400
silicide	Mn_7, Si_2	15	solid	47,400
silicate	Mn, Si, O_3	15	solid	276,300

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Manganese				
sulphate	Mn, S, O_4	15	solid	249,400
"			dil. sol.	263,200
sulphide	Mn, S	15	solid	45,600
Mercuric				
chloride	Hg, Cl_2	15	solid	53,300
"			dil. sol.	50,300
cyanide	Hg, C_2, N_2	15	solid	−59,150
oxide	Hg, O	15	solid	21,500
selenide	Hg, Se	15	solid	6,300
sulphate	Hg, S, O_4	15	solid	165,100
Mercurous				
chloride	Hg, Cl	15	solid	31,320
oxide	Hg_2, O	15	solid	22,200
sulphate	Hg_2, S, O_4	15	solid	175,000
Nickel				
chloride	Ni, Cl_2	15	solid	74,700
"			dil. sol.	93,900
fluoride	Ni, F_2	15	solid	118,980
oxide	Ni, O	15	solid	61,500
selenide	Ni, Se	15	solid	14,700
sulphate	Ni, S, O_4	15	dil. sol.	228,700
sulphide	Ni, S	15	solid	19,500
telluride	Ni, Te	15	solid	11,600
Nitric				
acid	H, N, O_3		liquid	41,610
oxide	N, O		gas	−21,575
Nitrogen				
dioxide	N, O_2		gas	−8,125
tetroxide	N_2, O_4		gas	−2,650
Nitrous				
oxide	N_2, O		gas	−17,470
Palladium				
chloride	Pd, Cl_2	15	solid	40,500
cyanide	Pd, C_2, N_2	15	solid	−49,250
hydride	Pd_{15}, H	15	solid	4,600
oxide	Pd, O	15	solid	21,000
Phosphorous				
hydride (phosphine)	H_3, P	15	gas	4,900
oxybromide	P, O, Br_3		solid	120,750
pentoxide	P_2, O_5	15	solid	365,300
pentachloride	P, Cl_5		solid	104,990
trichloride	P, Cl_3		liquid	75,300

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Platinum				
chloride	Pt, Cl_4	15	solid	60,200
"			dil. sol.	79,800
hydride	Pt_{10}, H	15	solid	14,200
oxide	Pt, O	15	solid	17,000
Potassium				
bromate	K, Br, O_3		cryst.	84,060
"	KBr, O_3		cryst.	−11,250
bi-carbonate	K, H, C, O_3	15	solid	233,300
"			dil. sol.	228,000
carbonate	K_2, C, O_3	15	solid	282,100
"			dil. sol.	288,600
chlorate	K, Cl, O_3		solid	95,860
"	KCl, O_3		solid	−9,750
chloride	K, Cl	15	solid	105,700
"			dil. sol.	101,200
cyanate	K, C, N, O	15	solid	105,850
"			dil. sol.	100,650
cyanide	K, C, N	15	solid	33,450
"			dil. sol.	30,250
ferri-cyanide	K_3Fe, C_6, N_6			{ 129,600 / 100,800
ferrocyanide	K_4, Fe, C_6, N_6	15	solid	157,300
"			dil. sol.	145,300
fluoride	K, F	15	solid	110,000
"			dil. sol.	113,600
hydroxide	K, O, H	15	solid	104,600
"			dil. sol.	117,100
iodate	K, I, O_3		solid	124,490
"	KI, O_3		solid	44,360
nitride tri-	K, H_3, N	15	solid	30,700
nitrate	K, N, O_3	15	solid	119,000
"			dil. sol.	110,700
oxide	K_2, O	15	solid	98,200
"			dil. sol.	165,200
selenide	K_2Se	15	solid	79,600
"			dil. sol.	87,900
silver-cyanide	K, Ag, C_2, N_2	15	solid	13,700
"			dil. sol.	5,350
sulphate	K_2S, O_4	15	solid	344,300
"			dil. sol.	337,700
" acid	K, H, S, O_4	15	solid	276,100
" "			dil. sol.	272,900

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Potassium				
sulphide	K_2, S	15	solid	103,500
"			dil. sol.	113,500
" poly-	K, S_2	15	solid	59,300
" "			dil. sol.	59,700
Rubidium				
carbonate	Rb_2O, CO_2			20,570
" bi-	Rb, H, C, O_3			231,920
chloride	Rb, Cl		solid	105,940
hydroxide	Rb, H, O			101,990
"	Rb_2O, H_2O			51,480
oxide	Rb_2, O			83,500
Selenium				
hydride	Se, H_2	15	gas	−25,100
"			dil. sol.	−15,800
hydroxide (selenic)	Se, O_3, H_3	15	dil. sol.	79,300
" (selenous)	Se, O_2, H_2	15	solid	52,400
" "			dil. sol.	51,500
nitride	Se, N	15	solid	−42,300
Silicon				
carbide	SiC			1,963
chloride	Si, Cl_4	15	gas	128,800
fluoride	Si, F_4	15	gas	275,920
hydride	Si, H_4	15	gas	−6,700
dioxide	Si, O_2	15	solid	180,000
sulphide	Si, S_2		solid	40,000
Silver				
carbide	Ag, C	15	solid	−43,575
carbonate	Ag_2C, O_3	15	solid	123,800
chloride	Ag, Cl	15	solid	29,000
cyanate	Ag, C, N, O	15	solid	26,450
fluoride	Ag, F	15	solid	22,070
"			dil. sol.	25,470
nitrate	Ag, N, O_3	15	solid	28,700
"			dil. sol.	23,000
oxide	Ag_2, O	15	solid	7,000
selenide	Ag_2, Se	15	solid	2,000
sulphate	Ag_2S, O_4	15	solid	167,100
"			dil. sol.	162,600
sulphide	Ag_2, S	15	solid	3,000
Sodium				
borate, bi-	Na_2, B_4, O_7	15	solid	748,100
"			dil. sol.	758,300

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Sodium				
carbide	Na, C	15	solid	−4,400
carbonate	Na_2, C, O_3	15	solid	273,700
"			dil. sol.	279,300
" bi-	Na, H, C, O_3	15	solid	227,000
" "			dil. sol.	222,700
chloride	Na, Cl	15	solid	97,900
"			dil. sol.	96,900
cyanate	Na, C, N, O	15	solid	105,850
"			dil. sol.	100,250
cyanide	Na, C, N	15	solid	25,950
"			dil. sol.	25,450
fluoride	Na, F	15	solid	109,720
"			dil. sol.	109,120
hydroxide	Na, O, H	15	solid	102,700
"			dil. sol.	112,500
nitrate	Na, N, O_3	15	solid	110,700
"			dil. sol.	106,000
oxide	Na_2, O	15	solid	100,900
"			dil. sol.	155,900
" per-	Na_2O, O	19	solid	8,900
" "	Na_2, O_2	19	solid	119,800
phosphate	Na_3, P, O_4	15	solid	452,400
selenide	Na_2, Se	15	solid	60,900
"			dil. sol.	78,600
silicate	Na_2, Si, O_3		solid / liquid	326,100
sulphate	Na_2S, O_4	15	solid	328,100
"			dil. sol.	328,500
" bi-	Na, H, S, O_4	15	solid	269,100
" "			dil. sol.	268,300
sulphide	Na_2, S	15	solid	89,300
"			dil. sol.	104,300
" bi-	Na_2, S_2	15	solid	49,500
" "			dil. sol.	54,400
tellurate	Na_2O, TeO_3			124,300
titanate	Na_2O, TiO_2, O			69,700
zincate	Zn, Na_2O_2			67,600
"	Zn, O, Na_2O			87,000
Stannic chloride	Sn, Cl_4	15	liquid	129,800
oxide	SnO_2	15	solid	141,300
Stannous chloride	$SnCl_2$	15	solid	80,900
oxide	Sn, O	15	solid	70,700

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Strontium				
carbonate	Sr, C, O_3	15	solid	281,400
chloride	Sr, Cl_2	15	solid	184,700
"			dil. sol.	195,850
fluoride	Sr, F_2	15	solid	224,020
hydride	Sr, H_2	15	solid	38,400
hydroxide	Sr, O_2, H_2	15	solid	217,300
"			dil. sol.	227,400
oxide	Sr, O	15	solid	131,200
"			dil. sol.	158,400
selenide	Sr, Se	15	solid	67,600
silicate	Sr, SiO_3	15	solid	329,100
sulphate	Sr, S, O_4	15	solid	330,200
sulphide	Sr, S	15	solid	99,300
"			dil. sol.	106,700
Sulphur				
monochloride	S_2, Cl_2		liquid	14,260
oxide di-	S, O_2	15	gas	69,260
"			dil. sol.	77,600
" tri-	S, O_3	15	solid	91,900
" "			dil. sol.	141,000
Sulphuric				
acid	H_2, S, O_4	15	liquid	192,200
"			dil. sol.	210,200
anhydride	S, O_3		liquid	103,240
"	SO_2, O			32,160
Tellurium				
chloride (telluric)	Te, Cl_4			77,380
hydride	Te, H_2	15	gas	−34,900
hydroxide (telluric)	Te, O_3, H_3	15	dil. sol.	99,500
" (tellurous)	Te, O_2, H_2	15	solid	78,300
oxide	Te, O_2	15	dil. sol.	78,300
Thallic				
hydroxide	Tl, O_3H_3	15	solid	43,800
oxide	Tl_2, O_3	15	solid	87,600
Thallous				
chloride	Tl, Cl	15	solid	48,600
"			dil. sol.	38,400
fluoride	Tl, F	15	dil. sol.	54,405
hydroxide	Tl, O, H	15	solid	57,400
"			dil. sol.	54,300
oxide	Tl_2O	15	solid	42,800
"			dil. sol.	39,700
selenide	Tl_2, Se	15	solid	13,400

Name.	Formula.	Temp. °C.	Physical State.	Calories.
Thallous				
sulphate	Tl_2, S, O_4	15	solid	221,800
"			dil. sol.	213,500
sulphide	Tl_2, S	15	solid	21,600
Thorium				
chloride	Th, Cl_4			339,430
"	$Th, 2\ Cl_2$			300,200
oxide	Th, O_2			326,000
telluride	Tl_2, Te	15	solid	10,600
Water	H_2, O	15	solid	70,400
"			liquid	69,000
"			gas	58,060
Zinc				
carbonate	Zn, C, O_3	15	solid	197,500
chloride	Zn, Cl_2	15	solid	97,400
"			dil. sol.	113,000
cyanide	Zn, C_2, N_2	15	solid	−24,550
fluoride	Zn, F_2	15	dil. sol.	138,220
hydroxide	Zn, H_2, O_2	15	solid	83,500
nitrate	Zn, N_2, O_6	15	dil. sol.	131,700
oxide	Zn, O	15	solid	84,800
selenide	Zn, Se	15	solid	30,300
sulphate	Zn, S, O_4	15	solid	229,600
"			dil. sol.	248,000
sulphide	Zn, S	15	solid	45,600
telluride	Zn, Te	15	solid	31,000

CIV. — Heats of Solution

Name.	Formula.	Temp. °C.	Water.	Calories.
Acetic			Mols.	
acid	$H.C_2H_3O_2$	18	200	375
Aluminium				
chloride	$AlCl_3$		2500	+153,690
potassium sulphate	$K_2Al_2(SO_4)_4.24H_2O$		2400	−20,240
Ammonium				
bromide	NH_4Br		200	−4,380
chloride	NH_4Cl		200	−3,880
iodide	NH_4I		200	−3,550
nitrate	NH_4NO_3		200	−6,320
platinochloride	$(NH_4)_2PtCl_4$		660	−8,480
sulphate	$(NH_4)_2SO_4$		400	−2,370

Name.	Formula.	Temp. °C.	Water.	Calories.
			Mols.	
Antimony				
pentachloride	$SbCl_5$	18	1100	35,200
trichloride	$SbCl_3$	18	......	8,910
Arsenic				
acid	H_3AsO_4	18	230	−400
pentoxide	As_2O_5	18	......	6,000
tri-chloride	$AsCl_3$ liq.	18	900	17,580
Arsenious				
oxide	As_2O_3	18	......	− 7,550
Auric				
bromide	$AuBr_3$	......	2000	− 3,760
chloride	$AuCl_3$	......	900	+ 4,450
Barium				
bromide	$BaBr_2$	......	400	+ 4,980
"	$BaBr_2.2H_2O$	......	400	− 4,130
chlorate	$Ba(ClO_3)_2.H_2O$	......	600	−11,240
chloride	$BaCl_2$	......	400	+ 2,070
"	$BaCl_2.2H_2O$	......	400	− 4,930
hydroxide	$Ba(OH)_2$	......	......	+12,260
"	$Ba(OH)_2.8H_2O$	......	400	−15,210
iodide	$BaI_2.7H_2O$	......	500	− 6,850
nitrate	$Ba(NO_3)_2$	......	400	− 9,400
oxide	BaO	......	......	+34,520
sulphate	$BaSO_4$	......	......	− 5,580
Boric				
acid	$B_2O_3.3H_2O$	18	800	−10,790
Bismuth				
tri-chloride	$BiCl_3$	18	1600	7,830
Bromine	Br_2 liquid	18	600	1,080
Cadmium				
bromide	$CdBr_2$	......	400	+440
"	$CdBr_24H_2O$	......	600	− 7,290
chloride	$CdCl_2$	......	400	+ 3,010
"	$CdCl_2.H_2O$	......	400	+760
iodide	CdI_2	......	400	−960
nitrate	$Cd(NO_3)_2.H_2O$	......	400	+ 4,180
sulphate	$CdSO_4$	......	400	+10,740
"	$CdsO_4.H_2O$	......	400	+ 6,050
Cæsium				
bi-carbonate	$CsHCO_3$	......	......	− 4,317
chloride	$CsCl$	......	......	− 4,750
oxide	Cs_2O	......	......	11,840
sulphate	Cs_2SO_4	......	......	− 4,970
bi-sulphate	$CsHSO_4$	......	......	− 3,730

Name.	Formula.	Temp. °C.	Water.	Calories.
			Mols.	
Calcium				
bromide	$CaBr_2$		400	+24,510
"	$CaBr_2.6H_2O$		400	− 1,090
chloride	$CaCl_2$		300	+17,410
"	$CaCl_2.6H_2O$		400	− 4,310
hydroxide	$Ca(OH)_2$		2500	+ 2,790
iodide	CaI_2		400	+27,690
nitrate	$Ca(NO_3)_2$		400	+ 3,950
oxide	CaO		2500	+18,330
nitrate	$Ca(NO_3)_2.4H_2O$	400		− 7,250
sulphate	$CaSO_4$			+ 4,440
"	$CaSO_4.2H_2O$			−300
sulphite	$CaS_2O_6.4H_2O$		400	− 7,970
Cerium				
sulphate	$Ce_2(SO_4)_3.\ 4.4H_2O$		1200	+16,130
Citric				
acid	$C_6H_8O_7$		600	− 4,100
Cobalt				
chloride	$CoCl_2$		400	+18,340
"	$CoCl_2.6H_2O$		400	− 2,850
nitrate	$Co(NO_3)_2.6H_2O$		400	− 4,960
sulphate	$CoSO_4.7H_2O$		800	− 3,570
Cupric				
bromide	$CuBr_2$		400	+80,250
chloride	$CuCl_2$		600	+11,080
"	$CuCl_2.2H_2O$		400	+ 4,210
nitrate	$Cu(NO_3)_2.6H_2O$		400	−10,710
sulphate	$CuSO_4$		400	+15,800
"	$CuSO_4.5H_2O$		400	+ 9,340
Ferric				
chloride	$FeCl_3$		2000	+63,360
Ferrous				
chloride	$FeCl_2$		350	+17,900
"	$FeCl_2.4H_2O$		400	+ 2,750
sulphate	$FeSO_2.7H_2O$		400	− 4,510
Formic				
acid	$H.CHO_2$	18	200	150
Iodic				
acid	HIO_3	18	200	− 2,170
Iodine				
pentoxide	I_2O_5	18		− 1,790
Lead				
acetate	$PbC_4H_6O_4.3H_2O$		800	− 6,140
bromide	$PbBr_2$		2500	−10,040

Name.	Formula.	Temp. °C.	Water.	Calories.
			Mols.	
Lead				
chloride	$PbCl_2$		1800	− 6,800
nitrate	$Pb(NO_3)_2$		400	− 7,610
Lithium				
oxide	$Li_2O, 200H_2O$			31,200
Magnesium				
chloride	$MgCl_2$		800	+35,920
"	$MgCl_2.6H_2O$		400	+ 2,950
hydroxide	$Mg(OH)_2$			0
potassium sulphate	$KMg(SO_4)_2.6H_2O$		600	−10,020
nitrate	$Mg(NO_3)_2.6H_2O$		400	− 4,220
sulphate	$MgSO_4$		400	+20,280
"	$MgSO_4.H_2O$		400	+13,300
"	$MgSO_4.7H_2O$		400	− 3,800
sulphite	$MgS_2O_6.6H_2O$		400	− 2,960
Manganese				
chloride	$MnCl_2$		350	+16,010
"	$MnCl_2.4H_2O$		400	+ 1,540
nitrate	$Mn(NO_3)_2$			12,930
sulphate	$MnSO_4$		400	+13,790
"	$MnSO_4.H_2O$		400	+ 7,820
Mercuric				
chloride	$HgCl_2$		300	− 3,300
Nickel				
chloride	$NiCl_2$		400	+19,170
"	$NiCl_2.6H_2O$		400	− 1,160
nitrate	$Ni(NO_3)_2.6H_2O$		400	− 7,470
sulphate	$NiSO_4.7H_2O$		800	− 4,250
Nitric				
acid	HNO_3	18	300	7,480
Nitrogen				
carbide	N_2, C_2	15	gas	−73,000
"			dil. sol.	−67,100
Oxalic				
acid (cryst.)	$H_2.C_2O_4.2H_2O$		530	− 8,590
Phosphoric				
acid	H_3PO_4, liquid	18	200	5,350
"	H_3PO_4, solid	18	120	2,690
Phosphorous				
acid	H_3PO_3, liquid	18	120	2,940
"	H_3PO_3, solid	18	120	−130
chloride, tri-	PCl_3, liquid	18	1000	65,140
pentoxide	P_2O_5	18	550	35,600

Name.	Formula.	Temp. °C.	Water.	Calories.
			Mols.	
Potassium				
acetate	$KC_2H_3O_2$		200	+ 3,340
bromate	$KBrO_3$		200	− 9,760
bromide	KBr		200	− 5,080
carbonate	K_2CO_3		400	+ 6,490
"	$K_2CO_3.\frac{1}{2}H_2O$		400	+ 4,280
chlorate	$KClO_3$		400	−10,040
chloride	KCl		200	− 4,440
cyanide	KCn		175	− 3,010
dichromate	$K_2Cr_2O_7$		400	−16,700
di-thionate	$K_2S_2O_6$		500	−13,010
hydroxide	KOH		250	+13,290
iodate	KIO_3		500	− 6,780
iodide	KI		200	− 5,110
nitrate	KNO_3		200	− 8,520
oxalate	$K_2C_2O_4.H_2O$		800	− 7,410
palladic chloride	K_2PdCl_6			−15,000
chlorplatinate	K_2PtCl_6			−13,760
"	K_2PtCl_4		600	−12,220
bromplatinite	K_2PtBr_4		800	−10,630
permanganate	$KMnO_4$		1000	−20,790
acid sulphate	$KHSO_4$		200	− 3,800
sulphate	K_2SO_4		400	− 6,380
Rubidium				
carbonate	Rb_2CO_3			9,077
bi-carbonate	$RbHCO_3$			4,731
chloride	$RbCl$			− 4,460
oxide	Rb_2O			83,000
sulphate	Rb_2SO_4			− 6,660
bi-sulphate	$RbHSO_4$			− 3,730
Silver				
nitrate	$AgNO_3$		400	−10,880
sulphate	Ag_2SO_4		1400	− 4,480
Sodium				
acetate	$NaC_2H_3O_2$		200	+ 3,870
"	$NaC_2H_3O_2.3H_2O$		400	− 4,810
ammonium phosphate	$Na_2NH_4PO_4.4H_2O$		800	−10,750
bi-borate	$Na_2B_4O_7.10H_2O$		1600	−25,860
bromide	$NaBr$		200	−190
"	$NaBr.2H_2O$		300	− 4,710
carbonate cryst	Na_2CO_3		400	+ 5,640
"	$Na2CO_3.H_2O$		400	+ 2,250

Name.	Formula.	Temp. °C.	Water.	Calories.
			Mols.	
Sodium				
carbonate cryst.	$Na_2CO_3.2H_2O$		400	+20
"	$Na_2CO_3.10H_2O$		400	−16,160
chloride	$NaCl$		100	− 1,180
hydroxide	$NaOH$		200	+ 9,940
hydrogen phosphate	Na_2HPO_4		400	+ 5,640
" "	$Na_2HPO_4.2H_2O$		400	−390
" "	$Na_2HPO_4.12H_2O$		400	−22,830
iodide	NaI		200	+ 1,220
"	$NaI.2H_2O$		300	− 4,010
nitrate	$NaNO_3$		200	− 5,030
oxide	Na_2O			56,500
chlorplatinate	$Na_2PtCl_6.6H_2O$		900	−10,630
sulphate	Na_2SO_4		400	fused +460
			400	efflor'd +170
"	$Na_2SO_4.H_2O$		400	− 1,900
"	$Na_2SO_4.10H_2O$		400	−18,760
" bi-	$NaHSO_4$		200	+ 1,190
thiosulphate	$Na_2S_2O_3.5H_2O$		400	−11,370
Stannic				
chloride	$SnCl_4$		300	+29,920
Stannous				
chloride	$SnCl_2$		300	+350
"	$SnCl_2.2H_2O$		200	− 5,370
Strontium				
bromide	$SrBr_2$		400	+16,110
"	$SrBr_2.6H_2O$		400	− 7,220
chloride	$SrCl_2$		400	+11,140
"	$SrCl_2.6H_2O$		400	− 7,500
hydroxide	$Sr(OH)_2$			+11,640
"	$Sr(OH)_2.8H_2O$			−14,640
nitrate	$Sr(NO_3)_2$		400	− 4,620
"	$Sr(NO_3)_2.4H_2O$		400	−12,300
oxide	SrO			+29,340
sulphite	$SrS_2O_6.4H_2O$		400	− 9,250
Sulphur				
dioxide	SO_2, liquid	18	300	1,500
trioxide	SO_3, liquid	18	1600	39,170
Sulphuric				
acid	H_2SO_4, liquid	18	1600	17,850
"	$H_2SO_4.H_2O$, liquid		1600	11,470
Pyrosulphuric				
acid	$H_2S_2O_7$, liquid	18	1600	54,320

Name.	Formula.	Temp. °C.	Water.	Calories.
Thallous			Mols.	
chloride	Tl_2Cl_2	......	9000	−20,200
hydroxide	$Tl(OH)$	......	470	− 6,310
nitrate	$TlNO_3$	......	600	−19,940
oxide	Tl_2O	......	570	− 3,080
sulphate	Tl_2SO_4	......	1600	− 8,280
Zinc				
bromide	$ZnBr_2$	......	400	+15,030
chloride	$ZnCl_2$	......	300	+15,630
iodide	ZnI_2	......	400	+11,310
nitrate	$Zn(NO_3)_2.6H_2O$	......	400	− 5,840
sulphate	$ZnSO_4$	......	400	+18,430
"	$ZnSO_4.H_2O$	......	400	+ 9,950
"	$ZnSO_4.7H_2O$	......	400	− 4,260
sulphite	$ZnS_2O_6.6H_2O$	......	400	− 2,420

CV.—Heats of Neutralization of Acids with Formation of Sodium Salts

Compound Formed.	Reaction.	Calories.
Sodium		
acetate	$HC_2H_3O_2$ 200 Aq, NaOH 200 Aq	13,400
arsenate	H_3AsO_4 200 Aq, 3NaOH 200 Aq	35,920
arsenite	$H_2As_2O_4$ 400 Aq, 2NaOH 400 Aq	13,780
borate	$H_2B_2O_4$ 300 Aq, 2NaOH 300 Aq	20,010
bicarbonate	H_2CO_3 Aq, NaOH Aq	11,016
bromate	$HBrO_3$ 400 Aq, NaOH 400 Aq	13,780
bromide	HBr 200 Aq, NaOH 200 Aq	13,750
carbonate	H_2CO_3 Aq, 2NaOH Aq	20,180
cyanide	HCN 100 Aq, NaOH 100 Aq	2,270
chlorate	$HClO_3$ 400 Aq, NaOH 400 Aq	13,760
chloride	HCl 200 Aq, NaOH 200 Aq	13,780
citrate	$H_3C_6H_5O_7$ 600 Aq, 3NaOH 600 Aq	38,980
chromate	H_2CrO_4 400 Aq, 2NaOH 400 Aq	24,720
fluoride	HF 200 Aq, NaOH 200 Aq	16,270
formate	$HCHO_2$ 200 Aq, NaOH 200 Aq	13,450
fluosilicate	H_2SiF_6 400 Aq, 2NaOH 400 Aq	26,620
hypochlorite	HClO 400 Aq, NaOH 400 Aq	9,980
hypophosphite	HPH_2O_3 250 Aq, NaOH 250 Aq	15,160
iodate	HIO_3 400 Aq, NaOH 400 Aq	13,810

Compound Formed.	Reaction.	Calories.
Sodium		
iodide	HI 200 Aq, NaOH 200 Aq	13,680
malate	$H_2C_4H_4O_5$ Aq, 2NaOH Aq	26,170
metaphosphate	HPO_3 400 Aq, NaOH 400 Aq	14,380
monochloracetate	$HC_2H_2ClO_2$ 200 Aq, NaOH 200 Aq	14,280
nitrate	HNO_3 200 Aq, NaOH 200 Aq	13,680
palladochloride	H_2PdCl_4 Aq, 2NaOH Aq	27,250
phosphate	H_3PO_4 450 Aq, 3NaOH 450 Aq	34,030
phosphite	H_2PHO_3 400 Aq, 2NaOH 400 Aq	28,450
platinichloride	H_2PtCl_6 600 Aq, 2NaOH 600 Aq	27,220
pyrophosphate	$H_4P_2O_7$ 800 Aq, 4NaOH 800 Aq	52,740
selenate	H_2SeO_4 400 Aq, 2NaOH 400 Aq	30,390
silicate	H_2SiO_3 200 Aq, 2NaOH 200 Aq	5,230
succinate	$H_2C_4H_4O_4$ 400 Aq, 2NaOH 400 Aq	24,160
sulphate	H_2SO_4 200 Aq, 2NaOH 200 Aq	31,380
sulphydrate	HSH Aq, NaOH Aq	7,740
sulphite	H_2SO_3 400 Aq, 2NaOH 400 Aq	28,970
tartrate	$H_2C_4H_4O_6$ 300 Aq, 2NaOH 300 Aq	25,310

CVI. — Relative Avidity of Acids

Molecules.	Acid.	Avidity.	Measured by		
			Electric Conductivity.	Hydrolysis of Methyl Acetate.	Inversion of Cane Sugar.
1	Nitric	1.00	0.996	0.92	1.00
1	Hydrochloric	1.00	1.00	1.00	1.00
1	Hydrobromic	0.89	1.01	0.98	1.11
1	Hydriodic	0.79	......	......	......
½	Sulphuric	0.49	0.65	0.74	0.73
½	Selenic	0.45	......	......	......
1	Trichloracetic	0.36	0.62	0.68	0.73
1	Orthophosphoric	0.25	0.07	......	0.06
½	Oxalic	0.24	0.20	0.17	0.18
1	Monochloracetic	0.09	0.05	0.04	0.05
1	Hydrofluoric	0.05	......	......	......
½	Tartaric	0.05	0.023	0.023	......
⅓	Citric	0.05	0.017	0.016	0.017
1	Acetic	0.03	0.004	0.003	0.004
½	Boric B_2O_3	0.01	......	......	......
½	Silicic	0.00	......	......	......
1	Hydrocyanic	0.00	......	......	......

CVII. — Heat of Combustion of Various Substances

Substance.	Burned to	Heat Evolved. Calories.	Heat Evolved. B.T.U.	Authority.
Alcohol, ethyl	CO_2+H_2O liquid	7184	12931	Favre and Silberman
ethyl	CO_2+H_2O liquid	7054	12697	Berthelot
methyl	....	5330	9594	....
Asphalt	....	9532	17159	Slossen and Colburn
Benzol C_6H_6 gas	CO_2+H_2O liquid	10070	18126	Berthelot
gas	CO_2+H_2O liquid	9650	17370	....
liquid	CO_2+H_2O liquid	10030	18054	Stohman
Cane sugar	....	3961	7130	Berthelot
Carbon crystallized	CO	2405	4329	Berthelot
crystallized	CO_2	7859	14146	Berthelot
amorphous	CO	2489	4480	Berthelot
amorphous	CO_2	8137	14647	Berthelot
amorphous	CO_2	8080	14544	Favre and Silberman
vapor	CO_2	11328	20390	Calculated
vapor diamond	CO_2	11134	20041	Berthelot
Carbonic oxide CO	CO_2	5640	10152	Thomsen
Cellulose	CO_2+H_2O liquid	4208	7574	Berthelot
Charcoal	CO	2473	4451	Favre and Silberman
"	CO	2442	4396	Berthelot
"	CO_2	8080	14544	Favre and Silberman
"	CO_2	8137	14647	Berthelot
beech	CO_2	7140	12852	Schwackhöfer
soft	CO_2	7071	12723	Schwackhöfer
sugar	CO_2	8040	14472	Favre and Silberman
Coal (pure and dry)	....	7800 9000	14040 16200	....
Coke gas	CO_2	8047	14485	Favre and Silberman
petroleum	CO_2	8017	14503	Mohler
Copper	CuO	590	1062	Thomsen
Gas, acetylene C_2H_2	CO_2+H_2O liquid	11927	21469	Berthelot
acetylene C_2H_2	CO_2+H_2O liquid	11527	20749	Thomsen
coal	....	4440 7370	7990 12266	....
ethylene C_2H_4	CO_2+H_2O liquid	11858	21344	Favre and Silberman
ethylene C_2H_4	CO_2+H_2O liquid	12072	21730	Berthelot
ethylene C_2H_4	CO_2+H_2O gas	11293	20327	Berthelot
methane CH_4	CO_2+H_2O liquid	13063	23513	Favre and Silberman
methane CH_4	CO_2+H_2O liquid	13344	24019	Berthelot

Substance.	Burned to	Heat Evolved.		Authority.
		Calories.	B.T.U.	
Gas, methane CH_4 . .	CO_2+H_2O gas. . .	12066	21719	Berthelot. . . . .
petroleum.	. . . .	10800	19440	. . . .
producer.	. . . .	{ 773 1370	1391 2466	. . . .
water.	. . . .	2350	4230	. . . .
water.	. . . .	3032	5458	. . . .
Glycerene.	CO_2+H_2O liquid	4316	7769	Stohman. . . . .
Graphite.	CO_2.	7901	14222	Berthelot. . . . .
Hydrogen.	H_2O liquid.	34462	62032	Favre and Silberman
"	H_2O liquid.	34180	61524	Thomsen. . . . .
"	H_2O liquid.	34500	62100	Berthelot. . . . .
"	H_2O gas.	28800	51840	Thomsen. . . . .
"	H_2O gas.	29150	52470	Berthelot. . . . .
Iron.	Fe_2O_3.	1582	2848	. . . .
Lignite (pure and dry)	. . . .	{6000 7000	10800 12600	. . . .
Magnesium.	MgO.	6077	10939	. . . .
Naphthalene.	CO_2+H_2O liquid	9690	17442	Berthelot. . . . .
"	CO_2+H_2O gas. . .	9354	16837	Berthelot. . . . .
Oil, cotton seed.	. . . .	9500	17100	. . . .
heavy coal gas. . . .	. . . .	8900	16020	St. C. Deville. . . . . .
olive.	. . . .	9473	17051	Stohman. . . . .
rape.	. . . .	9489	17080	Stohman. . . . .
schist.	. . . .	9000	1620	. . . .
sperm.	. . . .	10000	18000	Gibson. . . . .
Paraffin.	CO_2+H_2O liquid	11140	20050	Stohman. . . . .
"	CO_2+H_2O gas. . .	10340	18612	Stohman. . . . .
Peat.	. . . .	5940	10692	Bainbridge. . . . .
Petroleum.	. . . .	9600	17280	. . . .
"	. . . .	11000	19800	. . . .
Pitch.	. . . .	8400	15120	. . . .
Silicon.	SiO_2.	7407	13333	Berthelot. . . . .
Stearic acid.	CO_2+H_2O liquid	9374	16873	Stohman. . . . .
Starch.	CO_2+H_2O liquid	4228	7610	Berthelot. . . . .
Sulphur, rhombic . . .	SO_2.	2221	3998	Favre and Silberman
rhombic.	SO_2.	2166	3899	Berthelot. . . . .
monoclinic.	SO_2.	2241	4034	Thomsen. . . . .
Tallow.	. . . .	9500	17100	Stohman. . . . .
Wood, hard.	. . . .	4750	8550	Gottlieb. . . . .
soft resinous.	. . . .	5050	9090	Gottlieb. . . . .

CVIII.—Chemical Composition and Heat of Combustion of Anthracite Coal*

Source and Grade of Coal.	Chemical Composition.									Heat of Combustion.	
	Volatile Comb. Matter.	Carbon.		Hydrogen.	Oxygen.	Nitrogen.	Sulphur	Water.	Ash.	Calories.	B.T.U.
		Fixed.	Total.								
Lackawanna	5.0	84.0	......	.....	......	.....	.....	......	11.0	7724	13900
Black Mountain	2.17	92.41	......	.....	......	.....	.....	......	5.42	8333	15000
Lykens Valley buckwheat	6.21	76.94	......	.....	......	.....	.....	......	15.5	7833	14100
Lykens Valley buckwheat	5.0	81.0	......	.....	......	.....	.....	......	14.0	7583	13650
Mount Pleasant Scranton pea	7.49	76.28	......	.....	......	.....	.....	......	10.01	7806	14050
Treverton	6.67	85.66	90.66	1.73	0.78	.001	.....	0.84	6.83	8442	15195

* Most of the data for this table have been quoted from The Calorific Power of Fuels by Poole.

CIX.—Chemical Composition and Heat of Combustion of Bituminous Coal*

Source and Grade of Coal.	Chemical Composition.									Heat of Combustion.	
	Volatile Comb. Matter.	Carbon. Fixed.	Carbon. Total.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Water.	Ash.	Calories.	B.T.U.
Indiana: Brazil	34.49	50.30	70.50	4.76	16.29	1.36	1.39	8.98	6.28	8079	14542
Lancaster	37.44	47.22	71.41	5.56	18.42	1.54	0.62	12.66	2.68	7917	14251
Ohio: Brier Hill	36.4	59.1	......	.....	......	.....	.....	......	4.5	7888	14200
Hocking Valley	36.05	49.05	68.18	4.65	9.40	1.44	1.43	6.40	8.50	7767	13981
Waterford	37.29	53.34	74.39	4.98	6.42	1.40	3.44	1.55	7.82	8230	14814
Pennsylvania: Carnegie	36.42	56.20	77.20	5.10	7.22	1.68	1.42	1.45	5.93	8304	14947
West Virginia: Pocahontas	18.30	73.65	83.75	4.13	2.65	0.85	0.57	0.80	7.25	8768	15682
Pocahontas ad.	18.10	74.52	......	.....	......	.....	0.60	0.73	6.65	8751	15739
Thacker	35.00	57.10	78.90	4.98	5.64	1.42	1.16	1.40	6.50	8434	15181
Wyoming: Diamond	33.35	44.30	77.65	.....	......	.....	0.42	14.50	7.85	6477	11658
Harker	33.52	43.90	77.40	.....	......	.....	1.03	7.88	14.70	7433	13380
Jumbo	40.13	43.65	83.78	.....	......	.....	4.57	5.72	10.50	7873	14170

* Most of the data for this table have been quoted from The Calorific Power of Fuels by Poole.

CX.—Chemical Composition and Heat of Combustion of Oven Cokes*

Source of Coke.	Chemical Composition.									Heat of Combustion.	
	Volatile Comb. Matter.	Carbon.		Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Water.	Ash.	Calories.	B.T.U.
		Fixed.	Total.								
Connellsville, Pa.	0.46	89.58	.....	.....	.....	.....	0.81	0.03	9.11	7895	14211
Dade, Pa.	0.09	75.94	.....	.....	.....	.....	0.67	0.54	21.75	7953	14315
Pineville, W. Va.	0.04	94.66	.....	.....	.....	.....	0.69	1.14	3.57	8006	14128
Pocahontas, W. Va.	0.66	92.80	.....	.....	.....	.....	0.55	0.66	4.91	8032	14457
Pratt, Pa.	1.58	88.87	.....	.....	.....	.....	1.18	1.92	8.99	7946	14300
Seymore, Pa.	0.63	90.65	.....	.....	.....	.....	0.85	0.22	7.65	8036	14468
St. Bernard, Pa.	0.34	90.69	.....	.....	.....	.....	2.37	.....	8.96	7995	14340

* Most of the data for this table have been quoted from The Calorific Power of Fuels by Poole.

CXI.—Chemical Composition and Heat of Combustion of Lignite*

Source of Coke.	Chemical Composition.									Heat of Combustion.	
	Volatile Comb. Matter.	Carbon.		Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Water.	Ash.	Calories.	B.T.U.
		Fixed.	Total.								
Cañon City, Col.	37.61	51.36	......	7.38	9.27	1.50	1.02	7.01	4.03	7276	13097
Erie, Col.	32.71	45.98	......	4.25	6.65	1.64	0.52	18.57	2.74	6311	11360
Golden City, Col.	44.74	34.89	......	5.14	14.60	1.50	0.42	17.15	3.22	5432	9778
Golden City, Col.	36.20	42.08	......	5.07	27.77	1.20	0.43	18.35	3.37	4530	8154
Golden City, Col.	41.23	38.46	......	4.89	13.88	0.95	0.30	17.64	2.67	5526	9947
Gunnison River, Col.	12.16	84.65	......	3.72	4.20	1.62	0.70	1.50	2.29	7911	14240
Lechner's South Park, Col.	33.79	58.62	......	5.23	12.86	2.35	0.47	6.30	1.28	6780	12204

* Most of the data for this table have been quoted from The Calorific Power of Fuels by Poole.

CXII. — Chemical Composition and Heat of Combustion of Wood*

Name.	Chemical Composition.						Heat of Combustion.	
	Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Ash.	Water.	Calories.	B.T.U.
Ash	49.18	6.27	43.91	0.07	0.57	......	4711	8480
Beech	49.06	6.11	44.17	0.09	0.57	......	4774	8591
Birch	48.88	6.06	44.67	0.10	0.29	......	4771	8586
Elm	48.89	6.20	44.25	0.06	0.50	......	4728	8510
Fir	50.36	5.92	43.39	0.05	0.28	......	5035	9063
Oak	50.16	6.02	43.36	0.09	0.37	......	4620	8316
Pine	50.31	6.20	43.08	0.04	0.37	......	5085	9153
Tan bark	.....	....	.....	....	15.0	......	3389	6100
" "	.....	....	.....	....	....	30.0	2380	4284

CXIII. — Chemical Composition and Heat of Combustion of Petroleum *

Source.	Grade.	Specific Gravity.	Chemical Composition.				Heat of Combustion.	
			Carbon.	Hydrogen.	Oxygen + Nitrogen.	Oxygen.	Calories.	B.T.U.
Ohio	Heavy	0.887	84.2	13.1	2.7	...	10399	18718
	Lima	......	80.2	17.1	2.7	....	12000	21600
Pennsylvania	Crude	0.938	84.9	13.7	....	1.4	11520	20736
	Heavy	0.886	84.9	13.7	1.4	....	10672	19210
	Light	0.826	82.0	14.8	3.2	....	9963	17930
West Virginia	Heavy	0.928	88.3	13.9	....	0.8	10102	18184
	Heavy	0.873	83.5	13.3	3.2	....	10180	18324
	Light	0.841	84.3	14.1	1.6	....	10223	18400
Russia	Crude	0.884	86.3	13.6	....	0.1	12650	22628
	Crude	0.938	86.6	12.3	....	1.1	10800	19440

* Most of the data for this table have been quoted from The Calorific Power of Fuels by Poole.

CXIV.—Chemical Composition and Heat of Combustion of Natural Gas*

Source of Gas.	Chemical Composition.									Heat of Combustion.	
	Hydrogen, H_2.	Methane, CH_4.	Ethylene, C_2H_4.	Illuminants.	Carbon Dioxide, CO_2.	Carbon Monoxide, CO.	Oxygen, O_2.	Nitrogen, N_2.	Hydrogen Sulphide, H_2S.	Calories per Cu. M.	B.T.U. per Cu. Ft.
Indiana, Kakomo	1.42	94.16	0.30	......	0.27	0.55	0.30	2.80	0.18	9581	1030
Munice	2.35	92.67	0.25	......	0.25	0.45	0.35	3.53	0.15	9477	1019
Kentucky, Louisville	1.31	87.75	......	......	6.60	......	......	4.34	......	8849	939
New York, Olean	......	96.50	......	1.00	......	0.50	2.00	......	......	9900	1071
W. Bloomfield	......	82.41	......	2.94	10.11	......	0.23	4.31	......	9158	998
Ohio, Findlay	2.18	92.60	......	0.31	0.26	0.50	0.34	3.61	0.20	10250	1100
Pennsylvania, Burn's Well	6.10	75.44	18.12	trace	0.34	trace	......	......	......	10090	1170
Cherry Tree	22.50	60.27	6.80	......	2.28	......	0.38	7.32	......	8034	840
E. Liberty	9.64	57.85	0.80	5.20	......	1.00	2.10	23.41	......	5581	592
Leechburg	4.89	89.65	4.39	0.56	0.35	0.26	......	......	......	9962	1073
Grapeville	24.56	14.93	0.96	39.64	trace	trace	0.12	18.69	......	8326	891
Murraysville	19.56	78.24	......	......	......	......	2.20	......	......	8458	900
Pittsburg	20.02	72.18	......	6.30	0.80	1.00	0.80	......	......	8620	917

* Most of the data for this table have been quoted from The Calorific Power of Fuels by Poole.

CXV. — Chemical Composition and Heat of Combustion of Coal Gas *

Source of Gas.	Chemical Composition.									Heat of Combustion.	
	Hydrogen, H_2.	Methane, CH_4.	Ethylene, C_2H_2.	Illuminants.	Carbon Dioxide, CO_2.	Carbon Monoxide, CO.	Oxygen, O_2.	Nitrogen, N_2.	Hydrogen Sulphide, H_2S.	Calories per Cu. M.	B.T.U. per Cu. Ft.
Boston, Mass.	47.49	38.67	5.21	......	1.04	6.74	......	0.85	......	6095	651
Cape Breton, Canada	44.6	39.2	......	6.2	1.4	4.5	0.6	3.3	......	5460	612
Cape Breton, Canada	45.4	36.5	......	5.2	2.2	3.6	0.6	6.3	......	5455	611
Cincinnati, Ohio	45.85	39.26	5.17	......	0.82	4.78	0.41	3.71	......	6039	645
Cleveland, Ohio	34.80	28.80	9.50	1.70	0.20	10.40	0.40	14.20	......	6151	657
Coke Ovens, Johnston, Pa.	57.2	18.8	......	0.8	2.00	3.20	......	18.0	......	3736	399
Coke Ovens, Westphalia	53.2	36.11	......	2.24	1.41	6.49	......	......	0.43	5730	612
Hoboken, N. J.	39.50	37.30	5.85	0.75	2.70	4.30	1.40	8.20	......	6039	645
International, Canada	46.5	35.7	......	5.0	3.1	5.7	0.5	3.7	......	5536	620
Newton, Mass.	50.59	34.80	......	5.23	1.16	6.16	......	2.06	......	5608	599

* Most of the data for this table have been quoted from The Calorific Power of Fuels by Poole.

CXVI.—Chemical Composition and Heat of Combustion of Water Gas *

Source of Gas.	Chemical Composition.									Heat of Combustion.	
	Hydrogen, H_2.	Methane, CH_4.	Ethylene, C_2H_4.	Illuminants.	Carbon Dioxide, CO_2.	Carbon Monoxide, CO.	Oxygen, O_2.	Nitrogen, N_2.	Hydrogen Sulphide, H_2S.	Calories per Cu. M.	B.T.U. per Cu. Ft.
Anthracite gas	52.76	....	....	4.11	2.05	35.38	....	4.43	....	3385	386
Coke	50.10	....	....	0.70	4.00	40.00	....	5.3	....	2859	294
Coke and bituminous coal	94.08	....	....	....	0.50	3.54	....	0.12	....	3032	324
Granger process (uncarburetted)	52.88	2.16	....	3.47	....	36.8	....	4.69	....	2642	283
Granger process (carburetted)	30.0	24.0	12.5	0.3	....	29.0	0.2	2.5	1.5	6000	640
Granger process (from coke)	52.41	0.2	....	....	4.8	11.5	....	0.47	....	3098	331
Loomis process, Boston, Mass.	53.40	3.10	....	0.29	7.60	29.50	....	6.05	....	2884	308
Lowe process, Des Moines (1½ gal. oil)	41.7	12.2	....	5.4	4.5	34.6	0.4	1.2	....	4580	490
Lowe process, Des Moines (2½ gal. oil)	37.6	16.5	....	8.9	3.7	30.7	0.7	1.9	....	5514	590
Lowe process, Philadelphia, Pa.	50.9	....	....	....	....	44.5	0.07	2.08	....	3062	327
New York City, 1897	32.7	16.8	....	14.4	2.4	30.2	0.4	3.1	....	7160	766
Rose-Hastings, Louisville, Ky. (soft c'l)	36.4	23.2	....	14.05	3.02	19.1	1.15	3.08	....	6140	657
Rose-Hastings (generator gas)	9.8	49.6	....	1.1	8.1	28.1	0.3	3.9	....	3482	390
Rose-Hastings (enriched)	26.0	34.6	....	11.9	5.6	10.9	0.3	1.6	....	6000	673
Strong Process, Yonkers, N. Y.	52.76	4.11	....	....	2.05	35.88	0.77	4.43	....	2900	315

* Most of the data for this table have been quoted from The Calorific Power of Fuels by Poole.

STOICHIOMETRY

BY

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WEIGHT AND MASS

FUNDAMENTAL UNITS

Velocity (v) is equal to the distance travelled, divided by the time required to do so. v = distance/time.

The Unit of Velocity (u) is the velocity of a point that traverses the unit distance, in the unit of time. u = cm./sec.

The Unit of Acceleration. (a)— The acceleration per unit of time a is equal to the addition to a velocity, of another velocity u equal to the unit of velocity. a *cm.* per *sec.* $= u$, $a = u$/sec. = (cm./sec.)/sec. $= a =$ cm./sec.^{2}.

Acceleration produced by Gravity (g).—It has been found that gravity will impart to any body, irrespective of its weight, an acceleration of 980.62 cm. per second per second (g) in mean latitude (45°); that is, the velocity attained by a freely falling body is 980.62 cm. per second, at the end of the first second of its fall. At the beginning of its fall, it has no velocity, while at the end of the first second of its fall, it travels with a speed that carries it 980.62 cm. in one second. It has then traversed a distance of 980.62 cm./2 = 490.31 cm. The formula showing this, and from which g may be calculated after determining the other data experimentally, is $H = \frac{1}{2} gt^2$. H = height or distance travelled, in centimeters; t = time in seconds.

The Unit of Length, in physical computations, is the centimeter. This **centimeter** is the one one-hundredth part of the distance between two marks on a rod of a platinum-iridium alloy (9 parts platinum, 1 part iridium) kept in Paris in the archives of the Bureau of Standards. Since 1875 rods of this alloy have been made, and the distance of one meter indicated upon them by two fine lines. These rods have been supplied to those governments that have joined the "Meter Conference" originally held in Paris on the 20th of May, 1875. The original meter, made by Lenoir and still preserved in the archives in Paris, is the distance, from end to end, on a rod of platinum, at 0° C.

Originally the meter was intended to be the ten millionth part of a quadrant of the meridian. The reason that the length of the seconds pendulum was not taken as the unit was that, then, another element, *time*, would have been brought into consideration.

The Unit of Volume is equal to 1 centimeter cube, cm.^{3}.

The volume of 1000 ccm. was taken as a unit for common measure and called **a liter** which is also equal to the volume of one kilogram of pure water at 4° C. weighed in vacuo. The mass of a liter of water at 4° C. was adopted as the unit of mass, and called a **kilogram**. A mass of platinum-iridium alloy, made to coincide exactly with the mass of one liter of water at 4° C., is kept in the archives of the Bureau of Standards in Paris.

The Unit of Mass is the one thousandth part of the above standard kilogram or is equal to 1 gram; the unit of mass is, of course, also equal to the

mass of 1 gram of water at 4° C. The reason that the definition of the unit of mass refers to the above standard kilogram and not to the liter is that, when the metric system was evolved, it was intended to make the unit of mass equal to the mass of a cubic centimeter of pure water (very carefully distilled) at 4° C. The original kilogram standard was made in accordance with this intention. But it was then found that the comparison of kilogram weights could be made more accurately than the determination of the weight of a cubic centimeter of water at 4° C. Therefore, the above kilogram weight is taken as the standard of mass.

The Unit of Force, or the Dyne, is that force which gives to the unit of mass, in the unit of time, the unit of velocity. The dyne = (gram (mass) $\times$ cm.)/sec.

One of the fundamental laws of mechanics states that a unit force f, which gives to a unit mass m, in the unit time t, a unit velocity u (u = cm./sec.), varies directly as the quantities m and u, and inversely as the quantity t, or $f = c.m.u/t$. This c is a constant. But force is equal to mass times acceleration, and $u/t = (v/t)/t = v/t^2$ = acceleration. So $m.v/t^2$ = force unit. Consequently $mv/t = c.\ m.\ v/t$ and c must then be equal to 1. The force, exerted by the earth's attraction upon the mass of 1 gram, in mean latitude, 45°, is equal to 1×980.62 cm. gram/sec.^{2} or 1×980.62 dynes. The weight of 1 gram mass is, thus, 980.62 dynes, and 1 dyne force or weight = 1 gram mass/980.62 = 0.00102 grams weight.

Weight. — The force with which gravity acts upon a mass M is called the weight W of this mass. The forces thus acting are known by the same names as the masses upon which they act. The weight of a kilogram is the force with which the earth acts upon the mass of a kilogram. This latter force is in mean latitude, 980.62 cm./sec.^{2} and is generally designated by the letter g. Consequently the weight kilogram = the mass kilogram $\times$ g, or the force kilogram = mass $kg \times g$, or in the absolute system, we have, *force* (*weight*) kg = 1000×980.62 dynes.

The fact that masses and weights are designated by the same terms, although they depend upon entirely different units, and, therefore, have different numerical values, is often rather confusing. It is, therefore, necessary for the scientist always to bear in mind, when dealing with e.g., a kilogram, whether the weight (force) or the mass of the kilogram for example is meant.

Weighing. — The expression **weight** refers to the relative attraction of bodies for one another. Weight is not a characteristic of any one body, and as the "weight" of a body varies about $\frac{1}{2}$ per cent on the surface of the earth, the weight of any one body cannot be made unity. Special sets of weights would have to be made for at least each latitude.

The weights we use are masses to which we compare other masses. Our sets of "weights" are really sets of masses, and a weighing performed on an ordinary analytical balance is not a determination of weight, but a determination of mass.

The Unit of Pressure is that pressure in which the unit of force is exerted upon the unit of area. In other words, unit pressure is equal to a pressure of, or weight of, 1 dyne acting on a square centimeter (gram cm./sec.^{2})/cm.^{2} = gram/sec.^{2} cm.

Atmosphere. — The pressure exerted upon the area of one square centimeter by a column of mercury, 76.0 cm. high, at 0° C., at sea level and in a latitude of 45°, is known as a pressure of one atmosphere.

The mass of a unit volume of mercury is 13.596 times as great as the mass of a unit volume of water. The cross-section of the above column of mercury being 1 sq. cm. in area, the mass is, therefore, 1 (sq. cm.) $\times$ 76.0 (cm.) $\times$ 13.596 = 1033.296 grams. The weight of this mass pressing downwards is 1033. 296 $\times$ 980.62 cm./sec.^{2} at 45° latitude. And this is equal to 1,013,270.7 + dynes. At latitude 50° we have 1033. 296 $\times$ 981.1 cm./sec. 1,013,766.7 + dynes. At 45° latitude the value of 1 dyne in grams is 0.00102 (more correctly 0.0010196), and consequently the pressure there, of one atmosphere, will be 1,013,270.7+ $\times$ 0.0010196 grams = 1033.290 grams weight per square centimeter. The ratio of 981.1 : 980.62 is 1.0005 : 10. Therefore, if we multiply 1033.29 by 1.0005, we obtain the value in grams weight of 1 atmosphere at 50° latitude, which is equal to 1033.81 grams.

The constant g varies with the latitude, as we have just seen. It also varies with the height. The following formula enables us to calculate g for any latitude and for any height. $g = 980.6\ (1 - 0.0026 \times \cos 2\phi - 0.0000002\ H)$ cm./sec. ϕ = latitude in degrees. H = height in meters. g decreases as a body is raised above sea level, by 0.2 millionths parts for every meter of the value at sea level. Local variations amount to about as much. 0.0000002 is a mean, and is influenced by local topographical conditions. The entire variation at sea level is only about 0.5 per cent, g at the equator being 978.1 and at the pole 983.2.

It was the physicist Richter, who in the year 1672, when in Cayenne, noticed that the seconds pendulum was *shorter* than in his northern home. This led him to conclude that the force of gravity varied on the surface of the earth, $L = gt/TP$. At the equator g = 978.009, while at the pole, it is 983.089 (cm./sec.). The "weight" of 1 gram of mass, at the pole, will be 1 $\times$ 983 dynes, and that of the same mass, at the equator, will be only 1 $\times$ 978 dynes, or a difference of 5 dynes. As one dyne (see under Unit of Force) is equal to 0.001020 grams weight, the difference in weight of the mass of one gram, weighed at the pole, and at the equator, is 0.00510 grams.

Expansion. — The fractional increase in length of the unit of length, upon heating, varies with the temperature, and **the constant of variation,** at any particular range of temperature, **is called the coefficient of linear expansion.**

L = length at $t°$, L_0 = length at 0°, B = constant (coefficient), t = number of degrees between 0° and $t°$, then by definition $\left(\dfrac{L - L_0}{L_0 t}\right) = B.$

If B is known, this last equation permits us to calculate the length L for any temperature of a rod whose length at 0° was L_0.

Reduction of a Length to Length at 0°. — If we know the length L of a rod at $t°$, and if we know also B, then we can calculate the length L_0 that the rod would have at 0°. $L_0 = L/(1 + Bt)$. Since B is generally very small, $1/(1 + Bt) = 1 - Bt$, and we have, $L_0 = L(1 - Bt)$.

Cubical Coefficient of Expansion, a. — In the case of the superficial expansion of an isotropic material of unit length of side, at 0°, we obtain for $t°$ rise

in temperature a length of side of $1 + Bt$; the area will then be $1 + 2\,Bt + (Bt)^2$. As $(Bt)^2$ represents a very small number, we can neglect it. The coefficient of superficial expansion is then $2\,B$.

Similarly the cubical coefficient of expansion from 0° to t° is $3\,B$, for in the expression for the cubical contents, after expansion, $1 + 3\,Bt + 3\,Bt^2 + Bt^3$, the last two terms may be neglected, as being very small.

The cubical coefficient of expansion is generally expressed for brevity's sake, by the Greek letter α (alpha).

CALCULATION

Accuracy of Measurements

When making physico-chemical measurements, it must not be forgotten that errors of observation are unavoidable. These errors depend upon various causes, such as the individuality of the observer, the delicacy of adjustment of the instruments, change of temperature during the observation, and among still other causes, a change in the body during measurement, due to hygroscopic properties, or other causes not controllable.

Thus it will be seen that, in practice, several measurements of the same object, made at different times, may vary from each other, or the measurement of one sample may vary from that made of another sample of the same homogeneous object. The relative size of these differences is called "definition" by Ostwald-Walker who formulated the fundamental rule for measurements, as follows: The accuracy of the measurement must correspond to the exactness of the definition of the object to be measured. An example will illustrate this:

One hundred grams of a 1 per cent solution of a salt, in water, are to be made. It would be an error, in method, to weigh the water on the same delicate balance as the 1 gram of salt, striving in both cases, of course, for the same limit of accuracy, about 0.1 mg. The "definition" of such a quantity of water is uncertain, owing to evaporation, etc. Furthermore, an error of 0.1 mg. in the weight of the salt occasions the same error in the strength of the solution, as a one hundred times greater error in the weight of the water: 0.0001 g./1 g. = x/100, x = 0.01, = 0.01 per cent, and 0.01 g./100 g. = x/100, x = 0.01, = 0.01 per cent.

Figuring

Results should be given in so many figures, that the second last figure is fairly accurate, while the last figure is uncertain owing to errors of observation in making the measurements. In doubtful cases, it is advisable to carry one figure more rather than less. Arithmetically the results must be correct, and thus, in a longer calculation, e.g., one in which logarithms are used, one figure more than it is intended to report in the result, should be carried along, as otherwise, by dropping all but the number of figures intended for the final result, the last figure in the number may become wrong by several units.

Suppose, in measuring a cube whose edges are 2.10 cm., 1.01 cm., and 1.05 cm. long respectively, we make, in each case, an error of + 0.01 cm. The uncertainty, due to error of observation, lies in the second place of the decimal.

The final result, then, cannot agree with the actual facts, beyond this third figure of the number. This third figure is uncertain and cannot be made more certain by annexing figures to it:

$$2.11 \times 1.02 \times 1.06 = 2.281332, \text{ arithmetically.}$$
$$2.10 \times 1.01 \times 1.05 = 2.22705, \text{ arithmetically.}$$
$$2.09 \times 1.00 \times 1.04 = 2.1736, \text{ arithmetically.}$$

From the above the volume of the cube is 2.2 ± ccm.

Added zeros or those beginning decimal fractions are not counted when determining the number of figures with which to calculate or those that are to be reported.

SPECIFIC GRAVITY

Hydrostatic Pressure. — The weight of each layer of a liquid presses upon the layer beneath it so that the pressure increases with the depth of the liquid.

Let q be the area of the upper surface of such a layer, h the height of the column of liquid, and d its density; then the mass m of the liquid will be $m = q.h.d.$ And if g is the acceleration of gravity in the latitude where the determination is made, then the weight w of the liquid will be $w = q.h.d.g.$, and the pressure per unit area will be $p = \frac{q.h.d.g.}{q} = h.d.g.$ (Force = mass × acceleration, and pressure = force per unit area.) Every horizontal layer of liquid that has a layer of liquid above it of the height h will receive a pressure $p = h.g.d.$ This pressure, produced by gravity, is known as hydrostatic pressure.

TERMS USED IN CONNECTION WITH SPECIFIC GRAVITY

(1) The *specific gravity* of a homogeneous substance is expressed by a number indicating how many times heavier or lighter it is than the weight of an equal volume of water of maximum density 4° C. In other words, it is equal to the weight of the body divided by the weight of an equal volume of water at 4° C.

(2) The *density* of a homogeneous substance is equal to the mass of a unit volume of the substance. See (7).

(3) The *specific volume* of a homogeneous substance is equal to the volume of a unit mass of the substance. See (7).

(4) Density and specific volume are reciprocals of each other.

E.g., 10.53 = density of *Ag*. 10.53 grams. of *Ag* occupy 1 cm. 1 gram of silver occupies a volume of 1/10.53 c.cm. which equals the specific volume.

(5) The volumes of equal weights of bodies vary inversely as their specific gravities.

(6) The weights of equal volumes and the densities of substances vary directly as their specific gravities, and inversely as their specific volumes and as the volumes of equal masses.

(7) Figures representing specific gravity are relative figures, and as such independent of the absolute, or c.-g.-s.-system.

(8) Density and specific volume, however, are expressed in the absolute system.

According to (1) water at 4° C. has a specific gravity of 1, and as 1 ccm. of water at 4° C. contains 1 gram mass, the density of water at 4° C. in the c.-g.-s.-system is equal also to 1, or in other words, density and specific gravity in the absolute system are equal.

(9) In practice, generally, water of $t°$ is employed. This leads to the determination of the specific gravity of water at $t°$.

(10) Specific gravity of water of $t° = \frac{\text{weight of a body in water of } t°}{\text{weight of same body in water of } 4°}$ = the ratio of the weights of equal volumes (6).

(11) From (10) and (1) we obtain for the specific gravity of a homogeneous solid, determined in water of $t°$, specific gravity $= \frac{\text{weight of body at } t°}{\text{loss of weight in water at } t°}$ $\times$ specific gravity of water at $t°$.

Similarly, the specific gravity of a liquid is found as follows: Weigh a body in the liquid, and in water of the same temperature. The loss of weight of the body in the liquid and its loss of weight in water represent the weights of equal volumes of the liquid and of water, and we have

(12) Specific gravity $= \frac{\text{loss of weight of body in the liquid of } t°}{\text{loss of weight of body in water of } t°} \times$ specific gravity of water of $t°$.

METHODS FOR DETERMINING SPECIFIC GRAVITY OF SOLIDS

The Pycnometer. — Let the pycnometer, filled with water, or any other liquid as above, weigh p grams, the body m grams and the pycnometer, after the body has been dropped into the water and the overflow removed, p grams. The overflow, or the volume of water displaced by the body is, then, $v = p + m - p$. v ccm. water at 4° have a mass of v grams. $d = m/v$ and specific gravity $= m$ grams/v grams.

Nickolson's Hydrometer. — This instrument is so adjusted that when 10 grams are placed in the pan, the instrument sinks in distilled water, at 4° C. to a fixed mark 0 on the stem. Place in the pan a fragment of the body weighing less than 10 grams, and add the weight w required to sink the mark to the water level. Then the weight of the substance in air is $10 - w$. Remove the body to the cavity at the bottom of the instrument. Now add to the weight in the pan till the 0 mark again is at the water level. The additional weight represents the buoyancy of the body, or its apparent loss of weight in water. The specific gravity $= (10 - w)/w'$. Owing to the many sources of error, this instrument is but rarely used.

Jolly's Spring Balance. — The spiral spring of this balance when used for specific gravity determinations has fastened to it two weighing pans, the lower one of which is always submerged in water. The lower, free end of the spring may be shaped into a pointer.

With the aid of a set of weights weighing can readily be made with this instrument, by bringing the pointer end always to the same mark on a graduated scale fastened behind the spring. Without weights weighings may be performed by employing the principle that the elongation h of the spring is practically proportional to the weights w attached. $w = c \cdot h$. By a trial with a known weight the constant c is readily determined. Since in density determinations the weight factor can be eliminated, we can make use of the scale divisions as units.

If the pointer is lowered h scale divisions, when the body is placed in the upper pan, and h' divisions, when it is placed under water in the lower pan, we have: specific gravity $= h/(h-h')$.

As, however, the elongation is not absolutely the same for all weights, it is best to determine two constants, one for the greatest expected elongation and one for about one-half of that elongation. Then $w = ch + dh'$, c and d being the constants at the particular ranges, h and h'.

Solids Soluble in Water, and Heavier.—Weigh solid in air, then in a liquid of known specific gravity, in which it is insoluble. Weight in air divided by loss of weight in liquid is equal to the specific gravity, relative to the liquid employed: multiplying by specific gravity of the liquid employed gives the specific gravity of the substance.

Let the density of a substance relative to chloroform be 5. If the specific gravity of the latter be 1.476, to find the density referred to water, or the true specific gravity of the body, we proceed as follows:

(*a*) If the body were five times as heavy as an equal volume of water, a unit volume of it would weigh 5 grams. But as the weight of a unit volume of chloroform is 1.476 grams, and the unit volume of the body weighs as much as 5 unit volumes of chloroform, the unit volume of the body, or 1 c.cm. will weigh 5×1.476 grams or 7.38 grams. The specific gravity sought is, therefore, 7.38.

(*b*) Or, by (6), if x be the loss in weight of the body, when immersed in the liquid, and y be the weight of a like volume of water of the same temperature as the liquid, we have: $x : y :: 1.476 : 1$.

Dividing the weight in air, 5 (grams), by the weight of a like volume of water, 0.6775 (grams), we get the desired specific gravity, 7.38.

Still another method can be followed:

(*c*) Keeping in mind that density and specific volumes are reciprocals (4), and that specific volumes vary inversely as the specific gravities (6*a*), we find, taking the same figures as before:

$$\frac{5 = \text{volume of the chloroform, } t^\circ}{x = \text{volume of the water, } t^\circ} = \frac{1 = \text{specific gravity water, } 4^\circ \text{ C.}}{1.476 = \text{specific gravity chloroform, } 4^\circ \text{ C.}}$$

$$\text{therefore } x = 7.38 \text{ ccm.}$$

Now 7.38 ccm. of water weigh as much as 5 ccm. of chloroform (by the equation), and 5 ccm. of chloroform weigh as much as 1 ccm. of the body (4, and conditions of the problem). Consequently, 1 ccm. of the body weighs as much as 7.38 ccm. of water, and, therefore, (1) the specific gravity of the body is 7.38.

(*d*) Another method, depending upon the fact that the specific gravity varies directly as the density, gives us the two expressions: 5 = density, body at $t°$ relative to chloroform at $t°$, $\propto 1.476$ = specific gravity chloroform, at 4°. x = density, body at $t°$ relative to water at $t°$, $\propto 1.0$ = specific gravity, water at 4°.

$5 \propto 1.476$, $x \propto 1.0$. Combining and converting into an equation, we get: $5 \times 1.476 = x \times 1.0$, or in the form of a proportion, $5 : x :: 1 : 1.476$, or $5/x = 1/1.476$.

Solids Insoluble in Water, and Lighter. — In this case we must employ a sinker in order to immerse the substance in water. If we know the weight of the sinker in air and its specific gravity, we can find its weight in water as follows: By (10 and 12) we have specific gravity, e.g., 5, weight in air = 10 grams, weight in air divided by specific gravity equals volume of water displaced ($10/5 = 2$) or loss in weight in water. Therefore the weight of the sinker in water equals $10 - 2$ or 8.

The substance being lighter than water, the weight of sinker and substance in water will be less than that of the sinker alone. If we subtract from the weight of sinker and substance in water the weight of the sinker in water, we obtain the weight of the substance in water. This is a negative quantity, and is a measure of the buoyant power of the substance.

$$\text{Specific gravity} = \frac{\text{Weight in air}}{\text{Weight in air} - \text{loss of weight in water}} =$$

$$\frac{\text{Weight in air}}{\text{Weight in air} - (\text{weight of sinker} + \text{substance in water} - \text{weight of sinker in water})}.$$

To Illustrate. — Weight of substance in air, 5 grams. Weight of sinker in water, 12 grams. Weight of substance and sinker in water, 10 grams. Difference of weight of sinker and substance in water, and of sinker alone in water $= 10 - 12 = -2$ grams, and we have: $5 \div [5 - (-2)] = 5 \div 7 = 0.714$, the specific gravity sought.

Solids Soluble in Water, and Lighter. — Weigh with a sinker attached in some liquid that will not act on the substance. Calculate the density (specific gravity) relative to this liquid, and then find the true specific gravity, as under *B*.

To Illustrate. — Find specific gravity of potassium, given weight of potassium = 4 grams. Weight of sinker in air = 10 grams. Weight of potassium and sinker in ligroin = 8.6698 grams. Specific gravity of silver sinker = 10.53. Specific gravity of ligroin used = 0.73.

First find the specific gravity of the sinker referred to ligroin. Keeping in mind that density and specific volume are reciprocals of one another (4), and that the weights of equal volumes vary inversely as the specific volumes (6), we have $0.73 : 1 :: 10.63 : x \ldots x = 14.4246$ = specific gravity of sinker referring to ligroin.

Then find the weight of the sinker in ligroin. We have just found how many times heavier a unit volume of the sinker is than an equal volume of ligroin. Specific gravity (14.4246) = weight in air (10 grams) divided by loss in weight in ligroin $(10 - x) \ldots x = 9.3067$ grams.

Now following the reasoning under (*c*), we obtain the following equation:

$$\text{Specific gravity potassium} = \frac{4}{4 - [8.6669 - 9.3067]} = \frac{4}{4.6398} = 0.8621.$$

METHODS OF DETERMINING SPECIFIC GRAVITY OF LIQUIDS

1. Calibrated vessels, such as measuring flasks and cylinders, pipettes and burettes.

The volume of these vessels being known, we know the weight of an equal volume of water at 4° C. If now the weight of a definite volume of any liquid such as the contents of a liter flask is taken, we immediately have the necessary data, i. e. weights of equal volumes.

2. Pycnometer. — Here we have vessels of unknown volume, but either having a mark on the neck, or having glass stopper with a capillary hole. Thus the pycnometers are made to hold constant volumes. Constant temperature is obtained by the aid of a bath of constant temperature. For use in a determination the pycnometer is weighed empty, filled with water, and filled with the liquid under consideration. The weight of the pycnometer full of water minus the weight of the empty pycnometer is equal to the weight of the water it will hold. This weight, compared with the weight of the liquid that the pycnometer will hold, gives us the specific gravity of the liquid.

3. Hydrostatic Balance. — A body of sufficient density, e.g., a small thermometer, is suspended from the end of the balance arm. By placing weights in the balance pan suspended from the other end of the balance arm, we obtain the weight of the body in air. It is then weighed, still suspended from the balance arm, immersed in water, and finally it is weighed, immersed in the liquid whose density is to be determined.

The weight of the body in air minus its weight in water is equal to its loss of weight in water, and this loss corresponds to the weight of a volume of water equal to the volume of the body. Similarly, we find the weight of the same volume of the liquid. The ratio of the weights of this same volume of water and of the liquid represents the ratio of the densities.

A source of error is the frequently uneven wetting of the fine platinum suspending wire. This can be overcome, practically, by plating the wire with black platinum.

Another source of error is a bubble of air frequently formed by water or by the liquid in the loop of the wire from which the small thermometer is suspended.

Mohr-, Westphal-, Sartorius-, Specific Gravity Balances. — In these balances the right-hand half of the beam is divided into ten equal parts from the fulcrum to the point of suspension at the end of the beam. Suspended from this end of the beam is the sinker (thermometer), while a weight at the other end acts as a counterbalance. When the sinker is immersed in water of 4° C., the equilibrium of the balance is destroyed by the buoyancy of the water. To adjust the equilibrium, a weight equal to this force and in grams

equal to the weight of the volume of water displaced (which is equal to the volume of the sinker) is hung from the point of suspension. This weight is shaped somewhat like Ω and is called a *rider*. Other riders weighing respectively 0.1, 0.01, 0.001 of the weight of this rider constitute the set of weights used with these balances. With their aid we can directly read off from the balance beam the density of a liquid.

Hydrometers

These instruments consist of a spindle-shaped float, with a cylindrical neck containing a scale. They are weighted at their lower end, thus bringing the center of gravity very far down, and insuring an upright position when floating. They depend upon the principle that a body will sink in a liquid until enough liquid has been displaced, so that the weight of the displaced liquid equals the weight of the body.

The weight and volume are so adjusted, that the instrument sinks to the lowest mark on its neck in the heaviest liquid to be tested by it, and to the highest mark on its neck in the lightest liquid to be tested by it.

The Instrument always Displaces its own Weight of Liquid. — If we subdivide the stem of the hydrometer into any number of equidistant divisions of volume, such that each division represents the same multiple of the volume of the submerged portion of the hydrometer when floating in water, we can directly read off the volumes of equal weight, i.e., the specific volumes.

For example, let us mark with the number 100 the point up to which the hydrometer sinks in water, and let us subdivide the stem into 100 equal parts, by volume, such that each division represents one one-hundredth of the weight of the submerged volume of the hydrometer. Then, if the instrument sinks only up to the mark 75, for example, in a liquid whose density is to be determined, we know that 75 of the above parts, by volume, weigh as much as 100 of these parts by volume of water, or as much as the entire hydrometer weighs.

Water being unity, *the specific volume of the liquid* (compared with water, both volumes having the same weight), is as 75 parts volume liquid are to 100 parts volume water or 75/100 or 0.75.

Seventy-five volumes of the liquid, weighing the same as one hundred volumes of water, must be as much heavier than the water, as 75 is contained in 100, or 1.333+, consequently the relative density is 1.333+, which, if we have worked with water and liquid of 4° C., is the true *specific gravity* of the liquid.

From the following table, we see that if the same hydrometer were to be used for liquids only a little heavier than water and for those considerably heavier, that the intervals, between the lines indicating specific gravity, would become so small as to render the hydrometer entirely useless; for the errors of observation with hydrometers are relatively great, and the nearer the divisions the greater will be the error.

Therefore, hydrometers are made comprising only limited ranges of specific gravity, e.g., 10–1.2000, 1.2000–1.4000, 1.4000–1.6000.

As a rule, it is desirable to read off directly the specific gravity, and not the specific volume of a liquid. This specific gravity scale must be constructed: Equal differences of specific gravity are not represented by equal differences of parts volume marked on the stem:

Specific Gravity.	Degrees Immersed.	Difference.	x° = Degrees Immersed.
1.0	100.0	...	
1.1	90.9	9.1	Spec. grav. =
1.2	83.3	7.6	$100/x°$
1.3	76.9	6.4	$x° = 100/$spec.
1.4	71.4	5.5	grav.

Degrees Immersed.		Specific Gravity.	Difference.
100	100/100	1.0000	......
99	100/99	1.0101	0.0101
98	100/98	1.0204	0.0103
97	100/97	1.0309	0.0105
96	100/96	1.0417	0.0108
95	100/95	1.0526	0.0109
75	100/75	1.3333	......
50	100/50	2.0000	.6667
25	100/25	4.0000	2.0000
10	100/10	10.0000	6.0000
5	100/5	20.0000	10.0000
1	100/1	100.0000	80.0000

Baumé Hydrometer

This hydrometer is extensively employed in the chemical industries. It is named after the French chemist, Antoine Baumé, born in Senlis, France, in the year 1728. He described this instrument in the journal "Avant Coureur" in the years 1768 and 1769.

It depends upon the following principles:

The specific gravity of water, at the temperature at which the hydrometer is calibrated, and at which it is intended to be used, is taken as being unity, or specific gravity water at 17.5° C., e.g. 1.000.

In writing degrees Baumé is abbreviated to ° Bé.

The original Baumé hydrometer scale is marked 0° at the point up to which it sinks in a 10 per cent sodium chloride solution, and 10° at the point to which it sinks in water, both liquids being at 17.5° C.

The distance between these two fixed points is divided into ten equal divisions, and this scale is then continued above and below these points.

Frequently, for liquids heavier than water, rational Baumé scale hydrometers are used side by side with hydrometers for liquids lighter than water whose scale is calibrated according to the old Baumé system. This is likely to produce confusion.

Rational scale Baumé hydrometers have been proposed by Lunge. Here the scale is marked 0° at the point up to which the hydrometer sinks in water, and 10° at the point to which it sinks in a 10 per cent sodium chloride solution, both liquids being at 12.5° C.

According to Lunge, the numbers, indicating rational Lunge-Baumé degrees, are marked with the minus (−) sign, if the degrees refer to a liquid lighter than water.

The old Baumé scale gives us no indication as to whether a liquid lighter or heavier than water is under consideration. The following table* will illustrate what has just been said.

Rational Degrees Baumé-Lunge.	Specific Gravity.	Degrees Baumé.	Rational Degrees Baumé-Lunge.	Specific Gravity.	Degrees Baumé.
−50	0.743	60	+ 9	1.067	1
−25	0.852	35	+10	1.074	0
−10	0.935	20	+11	1.083	1
− 1	0.993	11	−15	1.116	5
0	1.000	10	+19	1.152	9
+ 1	1.007	9	+20	1.161	10
+ 5	1.036	5	+21	1.170	11

American Standard Baumé Scale. — These various Baumé scales have been the cause of great confusion. To do away with this uncertainty, the Manufacturing Chemists' Association of the United States has adopted a Baumé table calculated by aid of the following formulæ: For liquids heavier than water at 60° F.

$$^\circ\text{Bé} = 145 - \frac{145}{\text{sp. gr.}}, \text{ specific gravity} = \frac{145}{^\circ\text{Bé.} - 145}.$$

For liquids lighter than water at 60° F.

$$^\circ\text{Bé} = \frac{140}{\text{sp. gr.}} - 130, \text{ specific gravity} = \frac{140}{130 + {}^\circ\text{Bé}}.$$

The specific gravity determinations were made at 60° F., compared with water at 60° F. (60° F. = 15.55° C.+) and *are calculated for weights in air.*

Twaddle's hydrometer is generally employed in England. Its scale has 200 degrees, from 0° to 200°, corresponding to a change of specific gravity from 1 to 2. The degrees represent constant increases in specific gravity. Water at 4° C. is given a specific gravity of 1000. An increase of specific

* This table is taken from Dr. R. Dierbach, "Der Betriebschemiker," 2nd Ed., p. 100.

gravity of 5 units corresponds to an increase of 1° Tw. Therefore, at 15.55°C. specific gravity = 1 + .005 Tw°.

Alcoholometers frequently employed are those of Richter and of Tralles.

Richter's alcoholometer shows the per cent by weight of alcohol in an aqueous alcoholic solution. It has a decimal scale. The points up to which the instrument sinks in 0 per cent (H_2O), 5 per cent, 10 per cent, etc., solutions are noted, and the intervals are decimally subdivided.

Tralles' alcoholometer shows the percentage by volume of alcohol in an aqueous alcoholic solution. It is so constructed, that, for every per cent volume of alcohol shown on the scale, an equal volume of the instrument is submerged, e.g., with 100 per cent alcohol, the instrument should be just below the surface of the alcohol.

CORRECTIONS TO BE APPLIED IN SPECIFIC GRAVITY DETERMINATIONS

To obtain the *true* specific gravity of substances, their density, at 4° C., and in *vacuo*, must be compared with the density of water, at 4° C., in vacuo.

Correction for Temperature

Tables are published showing the weight of a cubic centimeter, or the volume of a gram of distilled water at different temperatures.

In case we know the weight of one cubic centimeter of water, at the temperature at which the density determination was made, we obtain (see definition 6):

(*a*) Specific gravity at 4°; specific gravity at $t°$; density at 4°; density at $t°$.

Specific gravity 4° = (specific gravity $t°$ × density, water at 4°)/density, water at $t°$.

Where we know the volume of a cubic centimeter, at $t°$, we obtain: Specific gravity at 4°: specific gravity at $t°$:: volume 1 ccm. water at $t°$: volume 1 ccm. water at 4°.

(*b*) Specific gravity 4° = (specific gravity $t°$ × volume 1 ccm. water, $t°$)/ volume 1 ccm. water, 4°.

If we know the cubical coefficient of expansion, at or around the temperature of the determination, we have $S = s\,[1 + a(t - T)]$, where s = density at temperature of determination, $t°$ (for a solid $t°$ = temperature in water), S = density at any other temperature T, while a = coefficient of expansion.

Most liquids have an irregular expansion. This is taken from tables. If the volumes of the same weight of a liquid be V at $T°$ and v at $t°$, and S and s be the densities at $T°$ and $t°$, we have:

$$S = s \times \frac{v}{V}.$$

For technical use, specific gravity is frequently determined at any convenient temperature, and referred to water, of either that same temperature, or to water at 4° C., weight in air being taken as a basis. Thus 15° C./15° C., after

the specific gravity figure, means that the temperature of the solid or liquid was 15° C., at the time of the determination, and that the weight of a unit volume of it was compared with the weight of a unit volume of water at 15° C. Similarly, 15° C./4° C., after the specific gravity figure, means that here comparison is made with the weight of a unit volume of solid or liquid at 15° C., with the weight of a unit volume of water at 4° C.

To convert from one system to the other, and to standard conditions, proceed as follows, taking the above figures to illustrate the method:

w 15° C. = weight unit volume of liquid at 15° C., w 15° C. = weight of unit volume of water at 15° C., w 4° C. = weight unit volume water at 4° C.

Specific gravity 15°/15° = w 15°/w 15°. Specific gravity 15°/4° = w 15°/w 4°.

Then w 15° = specific gravity 15°/15° × w 15°, and w 15° = specific gravity 15°/4° × w 4°, and we have:

(*c*) Specific gravity 15°/15° = (specific gravity 15°/4° × w 4°)/w 15°.

(*d*) Specific gravity 15°/4° = (specific gravity 15°/15° × w 15°)/w 4°.

To convert from specific gravity 15°/4° to 4°/4°, we proceed as under (*a*) or (*b*) above.

To Illustrate. — The density of Uranium is given as $18.685\frac{13°}{4°}$ on page 208. To obtain the true specific gravity, we obtain, from a table, the density of water at 13°, or the volume of 1 gram of water at 13°. Then, by (*a*): 18.685/0.99941 (density) = $18.696\frac{4}{4}$ and by (*b*) 18.685 × 1.00059 (volume) = $18.696\frac{4}{4}$.

Correction to Weight in Vacuo, and a Combination of this with the Temperature Correction

In the following discussion and formulæ, let d = density of water, at t°, used for comparison. λ = (0.00012), the mean density of air referred to water (see under atmosphere, p. 517), m = apparent mass (weight) in air of body, as found by aid of balance, or, in case of determinations of density of liquids with the aid of the glass body, e.g. (Westphal balance), the apparent loss of weight of this body when immersed in the liquid. w = apparent mass (weight) in air of the volume of water equal to the volume of the body. In case of liquids, w = apparent weight in air of the water in the pycnometer, or of the volume of water displaced by the glass body (buoyancy). In case of solids, w = apparent loss of weight of the body in water, in determinations depending upon buoyancy, or the apparent weight in air of the water displaced, when a solid is placed in the pycnometer full of water. m/w = *specific gravity, uncorrected.*

Discussion. — If a body, solid or liquid, weighs m in air, and displaces a mass of air, a, its weight in vacuo is $m + a$. In case the weight w of a volume of water equal to that of the solid, has been determined in air, its weight in vacuo will be $w + a$. Again, if the apparent loss of weight of a body by submersion in water was determined, this weight must also be increased by a, since, in vacuo, this weight would have been greater than in air by a. And again, if the density of a liquid is determined by comparing the apparent loss

of weight of a solid in water, and in the liquid, each loss must be increased, for the same reason as above, by a.

Now, if the water used did not have the density l, but had a density d, then the same volume of water would weigh, at 4°, not $w + a$, but $(w + a)/d$. Therefore, the true specific gravity of the body would be $S = (m + a)/[(w + a)/d] = (m + a)d/(w + a)$. Now as $(w + a)/d$ is equal to the volume of the displaced air (volume = weight/density), whose density is λ, the weight of this air will be $a = \lambda\,(w + a)/d$, or $a = \dfrac{w\lambda}{d - \lambda}\cdot$

Substituting this value for a in $S = (m + a)d/(w + a)$ we obtain

(1) $$S = (m/w)\,(d - \lambda) + \lambda \quad\text{or}\quad (m/w)d + (1 - m/w)\,\lambda.$$

Proof and derivation of above formula:

$$S = d\,\frac{m + \dfrac{w\lambda}{d - \lambda}}{w + \dfrac{w\lambda}{d - \lambda}} = d\,\frac{md - m\lambda + w\lambda}{wd - w\lambda + w\lambda} = \frac{md - m\lambda + w\lambda}{w} = \frac{md}{w} + \frac{w - m}{w}\lambda.$$

$$S = \frac{m}{w}\,d + \left(1 - \frac{m}{w}\right)\lambda = \frac{m}{w}\,d + \lambda - \frac{m}{w}\,\lambda = \frac{m}{w}\,(d - \lambda) + \lambda.$$

The importance of the corrections obtained by the above formulæ will become apparent from the following, showing that the uncorrected result may be as much as 0.08 too high.

A piece of Uranium weighs 37.37 grams in air. Specific gravity $U = 18.685^{\frac{13}{4}}$, 1 ccm. U weighs 18.685 grams in air. 1 gram U has a volume of 1/18.685 ccm. = 0.053518 ccm. 1 gram U displaces 0.053518 ccm. of air, 0.053518 ccm. of water. 37.37 grams U displaces 37.37×0.053518 ccm. = 2 ccm. of air and the same volume of water.

One ccm. air weighs 0.001293 gram, 2 ccm. air weighs 0.002586 gram. Weight of volume of water equal to volume of U = 2 grams. Weight in vacuo of $U = 37.37 + 0.002586$ gram = 37.372586 grams. Weight in vacuo of a volume of water equal to volume of $U = 2 + 0.002586$ gram = 2.002586.

Specific gravity U reduced to (weights in) vacuo = 37.372586/2.002586 = $18.662^{\frac{13}{4}}$. 18.685 in air − 18.662 in vacuo = 0.023 difference. $18.662^{\frac{13}{4}} = 18.673^{\frac{4}{4}}$. 18.696 − 18.673 = 0.023 difference.

If the expansion of water were neglected, the difference would be: Density $U^{\frac{t°}{4}}$ = specific gravity, 4° × density water, $t°$. Density $U^{\frac{30}{4}} = U^{\frac{4}{4}} \times$ density water, 30° = $18.592^{\frac{30}{4}}$. Differences: $18.673 - 18.662^{\frac{13}{4}} = 0.011$, $18.673 - 18.592^{\frac{30}{4}} = 0.081$.

Corrections for Differences in Temperature During the Determination of Density, with the Pycnometer or with the Aid of the Glass Body or Sinker

If, when using the pycnometer, there is a difference of temperature between the water and the liquid whose density is to be compared, the mass of the volume of water of t_n degrees and density d_n has to be recalculated to the mass

of the volume of water that would fill the pycnometer at t degrees and that would then have a density d.

If the net weight of, or the weight in water, or the buoyancy in water (of the glass body or sinker), at the temperature t_n, indicates an apparent net weight w_n, or an apparent buoyancy w_n, then, to find the corresponding weight w, or buoyancy w, at another temperature, t, at which the net weight, in the pycnometer, of the liquid whose density is to be determined was found, or at which the buoyancy of the glass body or sinker in the liquid was found, or the temperature of the water, or other liquid, in a pycnometer, after putting into it a solid whose density is to be determined, was found, we have:

The correction for the expansion of water will be an addition of $w_n (d - d_n)$ to W_n, and the correction for the increase in volume of the water due to the increase in volume of the pycnometer will be an addition of $w_n B (t - t_n)$ to w_n. We have now (definition 6) $d : d_n :: m/w : m/w_n = d : d_n :: m/wm : m/w_n m = d : d_n :: w : w_n$; $w = \dfrac{w_n d}{d_n}$, the pycnometer, or the glass sinker $= w_n + w_n [1 + 3\,B\,(t - t_n)] \therefore\ w = w_n [1 + 3\,B\,(t - t_n)]\, d/d_n$. But as $d/d_n = 1 - (1 - d)/1 - (1 - d_n) = 1 + (d - d_n)$, the above expression becomes: $w = w_n + w_n [(d - d_n) + 3\,B\,(t - t_n)]$. The quantity $(d - d_n)\, 3\,B\,(t - t_n)$ is insignificant, and, therefore, neglected.

This expression should be inserted in the formula (1) in place of w, then $S = [M/(w_n + w_n)]\,[(d - d_n) + 3\,B\,(t - t_n)]\,[(d - \lambda) + \lambda]$. The quantity in brackets can readily be taken from tables.

$$W = w_0 \frac{1 + 3\,B\,(t - t_0)}{A - 0.00120}.$$

This term should be determined for the temperature interval that is likely to occur, and plotted in a curve. For a determination at temperature t, take value for W and calculate specific gravity S (for temperature t degrees) where M = apparent weight of liquid in pycnometer, or equals apparent buoyancy in liquid.

$S = \dfrac{M}{W} + 0.00120$. Proof of this formula by combining formula 1 and 2.

Taken from Kohlrausch: Lehrbuck der proktischen physik, 9th Ed., p. 70 (top).

· Hydrometers have indicated upon their stem the temperature at which they are to be used. This temperature is usually 60° Fahrenheit (15.55° C.) on technical hydrometers, a temperature readily obtained and held constant. To obtain correct readings determinations should be made at this temperature. Liquids, as a rule, do not expand uniformly. Their expansion should be obtained from tables which have been experimentally obtained. If a table giving the volume of a mass of liquid at the temperatures T and t is at hand, then if S = specific gravity at $T°$, and if s be that at $t°$, we have (see under definition 5) $S/v = s/V$, $S = s.v/V$.

For given liquids, temperature allowances within a certain range of specific gravity are determined and published. These allowances are published in books dealing with chemical and physical tables and constants.

USE OF SPECIFIC GRAVITY TABLES

ACID CALCULATIONS

Large shipments of acid, particularly sulphuric acid, are usually billed and paid for on the basis of 66° Bé, 50° Bé, etc. It is, therefore, necessary to calculate the actual strength of the acid shipped to its equivalent in 66° Bé, 50° Bé or to whatever strength basis the acid is billed and paid for.

The weight of one cubic foot of water at 60° F. has been found to be 62.37 pounds. The weight of a cubic foot of an acid is its specific gravity multiplied by 62.37. The acid content corresponding to 66° Bé (oil of vitriol, O. V.) has been carefully ascertained and found to be 93.19 per cent H_2SO_4. (p. 392). A sample of sulphuric acid of 65.75° Bé containing 91.80 per cent H_2SO_4 is equivalent to

$$\frac{91.80}{93.19} \times 100 = 98.51 \text{ per cent O. V.,}$$

and as a cubic foot of 65.75° Bé acid weighs 114.12 pounds the number of pounds of oil of vitriol equivalent to one cubic foot of this acid is

$$\frac{91.80}{93.19} \times 114.12 = 112.42 \text{ pounds O. V.}$$

The equivalent per cent in 60° Bé (77.67 per cent H_2SO_4) of an acid of 64° Bé (85.66 per cent H_2SO_4) is

$$\frac{85.66}{77.67} \times 100 = 110.29 \text{ per cent } 60° \text{ Bé,}$$

and as 60° Bé corresponds to 1.7059 specific gravity, the pounds of 60° Bé equivalent to one cubic foot of 64° Bé acid is

$$\frac{85.66}{77.67} \times 1.7059 \times 62.37 = 123.14 \text{ pounds } 60° \text{ Bé.}$$

Correction for temperature must be made when determining the specific gravity. As an example illustrating the use to which the specific gravity tables may be put: suppose it is required to calculate the number of pounds of 50° Bé sulphuric acid in a shipment, the following data being given:

Forty-two inches of sulphuric acid are drawn out of the tank at a temperature of 101° F.

Suppose we find by calculating the capacity of the tank from the inside measurements that 1 inch of liquid in the tank corresponds to 50.00 cubic feet. A sample taken from the tank and tested in the laboratory showed 56.88° Bé at 92° F. Correction must be made for the temperature in order to reduce it to 60° F., the temperature for which the tables are constructed:

$$92 - 60 = 32 \text{ difference.}$$

From the table under the caption "Allowance for Temperature," it is seen that the allowance for 60° Bé acid is 0.026° Bé for each degree Fahrenheit,

and that the correction for 50° Bé acid is 0.026° Bé. As the acid in question is about midway between these points, the allowance for each degree Fahrenheit is very nearly 0.027° Bé. The correction for temperature is

$$32 \times 0.027 = 0.86° \text{ Bé},$$

and as the standard temperature, 60° F., is lower than 92° F., the temperature at which the Baumé of the sample was taken, this amount must be added. The Baumé of the acid at 60° F. is, then,

$$56.88 + 0.86 = 57.74° \text{ Bé}.$$

The Baumé of the acid at 101° F., the temperature at which the acid was drawn off, is calculated

$$101 - 60 = 41° \text{ F. difference},$$
$$41 \times 0.027 = 1.11° \text{ Bé correction},$$

and as the density of the acid is lowered as the temperature is raised

$$57.74 - 1.11 = 56.63° \text{ Bé at } 101° \text{ F}.$$

The easiest way to get the specific gravity corresponding to this degree Baumé is by interpolating the given data:

$$\begin{aligned} 57° \text{ Bé} &= 1.6477 \text{ specific gravity.} \\ 56° \text{ Bé} &= \underline{1.6292} \text{ specific gravity.} \\ \text{diff.} &= 0.0185 \text{ specific gravity.} \\ 56.63 - 56.00 &= 0.63° \text{ Bé difference.} \\ 0.0185 \times 0.63 &= 0.0117 \text{ specific gravity.} \\ 1.6292 + 0.0117 &= 1.6409 \text{ specific gravity} \\ &\quad \text{corresponding to } 56.63° \text{ Bé.} \end{aligned}$$

Then as 42 pounds were drawn from the tank, the pounds drawn off are

$$42 \times 50.00 \times 62.37 \times 1.6409 = 214{,}920 \text{ pounds}.$$

As the acid is sold on the basis of 50° Bé, the pounds of 50° Bé corresponding to 57.74° Bé acid is easily found by interpolating from the table.

$$\begin{aligned} 58° \text{ Bé} &= 119.59 \text{ per cent } 50° \text{ Bé acid.} \\ 57° \text{ Bé} &= \underline{117.00} \text{ per cent } 50° \text{ Bé acid.} \\ \text{diff.} &= \quad 2.59 \text{ per cent } 50° \text{ Bé acid.} \\ 2.59 \times 0.74 &= \quad 1.92. \\ 117 + 1.92 &= 118.92 \text{ per cent } 50° \text{ Bé acid corresponding} \\ &\quad \text{to } 57.74° \text{ Bé acid.} \\ 214{,}920 \times 1.1892 &= 255{,}827 \text{ pounds } 50° \text{ Bé acid.} \end{aligned}$$

PROBLEMS

1. (a) What is the per cent oil of vitriol (93.19 per cent H_2SO_4) equivalent to 62.18 per cent sulphuric acid? (b) What is the per cent of 50° Bé sulphuric acid (62.18 per cent H_2SO_4) equivalent to oil of vitriol?

Ans. (a) 66.72 per cent; (b) 149.87 per cent.

2. (a) What is the equivalent in oil of vitriol (93.19 per cent H_2SO_4) of 600 pounds of a sulphuric acid of 89.55 per cent H_2SO_4? (b) In 50° Bé sulphuric acid (62.18 per cent H_2SO_4)?

Ans. (a) 576.6 lbs.; (b) 864.12 lbs.

3. Knowing that 60° Bé sulphuric acid contains 77.67 per cent H_2SO_4 and that 50° Bé sulphuric acid contains 62.18 per cent H_2SO_4, what is the number of pounds of 50° Bé sulphuric acid equivalent to a cubic foot of 60° Bé sulphuric acid?

Ans. 132.91 lbs.

4. 50° Bé sulphuric acid contains 62.18 per cent H_2SO_4 and 52° Bé acid contains 65.13 per cent H_2SO_4. (a) To how many pounds of 50° Bé sulphuric acid are 350 cubic feet of 52° Bé acid equivalent? (b) If 60° Bé sulphuric acid contains 77.67 per cent H_2SO_4, to how many pounds of 60° Bé sulphuric acid are 530 cubic feet of 52° Bé acid equivalent?

Ans. (a) 35,647.5 lbs.; (b) 43,216.2 lbs.

5. Calculate the equivalent weight in terms of 60° Bé sulphuric acid equivalent to 2310 cubic feet measured at 102° F., a sample of which showed 59.66° Bé at 80° F.

Ans. 243,150 lbs.

6. Calculate the weight of 50° Bé sulphuric acid equivalent to a shipment of 2130.61 cubic feet measured at 120° F., a sample of which showed 56.14° Bé at 80° F.*

Ans. 252,410 lbs.

7. How many pounds of 66° Bé sulphuric acid are equivalent to a shipment of 2507 cubic feet measured at 92° F., a sample of which showed 65.52° Bé at 77° F.?

Ans. 282,614 lbs.

8. A sample of bismuth weighed 14.738 grams in air and 13.235 grams in water. (a) What is the density of the bismuth? (b) What is the weight of a cube of bismuth, 2 cm. on an edge? (c) How many cubic centimeters in a kilogram of bismuth?

Ans. (a) 9.805; (b) 78.44 grams; (c) 101.98 cc.

Rel. dens. = $W/(W - w)$.

(a) $14.738 - 13.235 = 1.503$ grams loss of weight in water

$14.738/1.503 = 9.805$ specific gravity.

Mass = rel. dens. × vol.

(b) Mass = $9.805 \times (2)^3 = 78.44$ grams.

Vol. = mass/specific gravity.

(c) Vol. = $1000/9.805 = 101.98$ ccm.

* In commercial transactions, calculations are often carried to a degree of accuracy unwarranted by the accuracy of the readings.

9. A sample of cork weighed 2.140 grams in air. A silver sinker (specific gravity 10.53) of 10.000 grams was employed, the combination of sinker and cork, in water, weighing 2.274 grams. Find the specific gravity of the cork. *Ans.* 0.240.

$$\text{Specific gravity} = W/(W + x - w).$$

The sinker will displace a volume of water equal to its volume. The weight of this water will be equal to the loss of weight of the sinker, when weighed in water.

$$10/10.53 = 0.9497 \text{ cm.} = 0.9497 \text{ gram.}$$
$$10.00 - 0.9497 = 9.0503 \text{ grams, weight in water of sinker.}$$

Substituting in the formula:

$$2.14/(2.14 + 9.0503 - 2.274) = 2.14/8.9163 = 0.240.$$

10. A block of pine weighed 6.431 grams in air. With a sinker attached to the block by a fine thread, the sinker being in water and the block in air, the combination weighed 18.530 grams; the combination of both sinker and block in water weighed 7.635 grams. Find the specific gravity of the block of pine. *Ans.* 0.5903.

$$\begin{aligned}\text{Specific gravity} &= W/(W' - W'') = 6.431/(18.53 - 7.635)\\ &= 6.431/10.895 = 0.5903.\end{aligned}$$

11. Find the specific gravity of a sample of sand, from the following data: Weight of sand taken 4.655 grams; weight of bottle full of water 80.04 grams; weight of bottle containing sand and filled up with water 82.755 grams. *Ans.* 2.399.

$$\begin{aligned}\text{Specific gravity} &= W/[W - (W'' - W')] = 4.655/[4.655 - (82.755 - 80.04)]\\ &= 4.655/1.94 = 2.399.\end{aligned}$$

12. A platinum ball weighed 42.96 grams in air, 40.96 grams in water, 39.548 grams in sulphuric acid, and 41.264 grams in naphtha. Find the specific gravity (a) of the sulphuric acid, (b) of the naphtha, and (c) of the platinum. *Ans.* (a) 1.706; (b) 0.848; (c) 21.48.

$$\text{Specific gravity} = (W - W'')/(W - W').$$

(a) $(42.96 - 39.548)/(42.96 - 40.96) = 3.412/2 = 1.706.$
(b) $(42.96 - 41.264)/(42.96 - 40.96) = 1.696/2 = 0.848.$
(c) $42.96/(42.96 - 40.96) = 42.96/2 = 21.48.$

13. (a) Convert specific gravity, 1.7957, into degrees Baumé. (b) Convert 65.25° Baumé (heavier than water) into specific gravity. (c) Convert specific gravity, 0.7692, into degrees Baumé. (d) Convert 51° Baumé (lighter than water) into specific gravity.

Ans. (a) 64.25°; (b) 1.8182; (c) 52°; (d) 0.7735.

14. 0.0203 gram of gold (specific gravity, 19.32) were plated on a brass weight having a superficial area of 13.5 sq. cm. What is the thickness of the gold plating? *Ans.* 0.000777 mm.

We have 0.0203 gram Au 1 cc. Au weighs 19.32 grams 0.0203/19.32 = volume of Au spread over 13.5 sq. cm. [(0.0203/19.32)/13.5] cc. = volume

of Au spread over 1 sq. cm., and this divided by 1 sq. cm. = thickness of Au film, 0.0000777 cm.

15. A steel sphere of 1.90 cm. diameter weighed 28.25 grams. What is the density of the steel sphere?

Ans. 7.866.

16. The best funnels are made with an angle of exactly 60°. If a funnel measures 7.5 cm. across the top, what size filter paper will fit it flush with the edge? *Ans.* 15 cm. diam.

17. A piece of aluminum wire 200 mm. long weighs 0.1327 gram. What length should be taken to make a centigram rider?

Ans. 15.05 mm.

18. A certain catalogue gives the following data about platinum foil: Platinum foil, medium, 0.003 inch thick, 1 gram per square inch. Assuming the price of platinum to be $0.80 per gram, what would a cone for electrolysis cost, having a slant height of 4 inches and a diameter at the base of 3 inches?

Ans. $15.09.

19. A block of wood, 7.49 × 7.46 × 3.78 cm. weighs 152.7 grams. What is its specific gravity? *Ans.* 0.723.

20. Linseed oil has a specific gravity of 0.930. What will it weigh per gallon? (1 gallon = 231 cubic inches.)

Ans. 7.758 lbs.

21. A drum has a capacity of 4 cubic feet, how many pounds of ammonia of 0.8917 specific gravity will it hold? (Take, the weight of one cubic foot of water as 62.37 pounds.)

Ans. 222.5 lbs.

22. What is the weight of 15 cubic feet of oil of vitriol, whose specific gravity is 1.8354? *Ans.* 1717 lbs.

23. What is the volume of 100 pounds of hydrochloric acid of 1.2003 specific gravity? *Ans.* 1.335 cu. ft.

24. A casting of iron weighs 1000 kilograms. Taking the specific gravity of iron as 7.23, what is its volume?

Ans. 138.3 liters.

25. A platinum wire 7.25 cm. long weighs 1.0762 grams. The specific gravity of platinum is 21.48. Find the diameter of the wire.

Ans. 0.938 mm.

26. What is the radius of a steel sphere (specific gravity = 7.81) equal in weight to a brass sphere (specific gravity = 8.40) of 1.5 cm. radius?

Ans. 1.54 cm.

27. Faraday estimated that the ductility of gold was so high that the gold in four English sovereigns could be drawn into a wire long enough to surround the earth. The weight of a sovereign is 7.988 grams, and it contains 91.66 per cent gold. If a quadrant of the earth is 10,000,857 meters, what is the thickness of the wire? (Specific gravity of gold = 19.3.)

Ans. 0.0002198 mm.

28. A casting of iron is suspected of having internal cavities. In air it weighs 170.42 grams; in water, 145.60 grams. The specific gravity of cast iron is 7.23. Has the casting any cavities, and if so, what is their volume?
Ans. 1.25 cc.

29. In obtaining the specific gravity of a sample of heavy spar, the following weights were obtained: weight in air, 5.127 grams; weight in water, 3.969 grams. What is the relative density of the sample?
Ans. 4.427.

30. In obtaining the specific gravity of a brass weight, the following readings were obtained: weight in air, 116.62 grams, weight in water, 102.81 grams, temperature of the water, 20° C. Volume 1 gram H_2O at 20° C. = 1.001773 cc. What is the specific gravity of the brass weight?
Ans. 8.430.

31. Find the weight of a cubic foot of water at 60° F. Density of water at 60° F. is 0.999050. *Ans.* 62.363 lbs.

32. Calculate the relative density of a block from the following data: Weight of block alone in air, 152.7 grams; weight of block in air, and sinker in water, 218.5 grams; weight of block and sinker in water, 9.5 grams.
Ans. 0.7306.

33. Find the relative density of gutta-percha from the following data: Weight of gutta-percha in air, 4.152 grams; weight of sinker in air, 10.450 grams; weight of sinker in water, 7.546 grams; weight of gutta-percha and sinker in water, 7.405 grams. *Ans.* 0.967.

34. A sample of willow weighed in air 3.820 grams. A sinker of lead (specific gravity 11.4) of a volume of 1.632 cc. was employed, the combination weighing in water 14.26 grams. What is the specific gravity of the willow?
Ans. 0.5847.

35. At a certain temperature a specific gravity flask holds 83.327 grams of alcohol (specific gravity, 0.8164), 155.79 grams of sulphuric acid, and 120.44 grams of potassium hydroxide solution. Determine the specific gravity (a) of the sulphuric acid, and (b) that of the potassium hydroxide solution.
Ans. (a) 1.526; (b) 1.180.

36. A piece of glass weighed 5.236 grams in air, and its specific gravity was 3.256. It weighed 3.702 grams in a solution of ammonia. Find the specific gravity of the ammonia. *Ans.* 0.9539.

37. A cylinder sank 54.40 centimeters when immersed in water, and 39.85 centimeters in gasoline. What is the relative density of the gasoline?
Ans. 0.7325.

38. A cylinder was immersed in water at 4° C., and was marked 1.000 at the depth to which it sank. It was then immersed in a liquid of 1.2083 specific gravity, and the depth to which it sank was marked 1.250. The distance between these marks was divided into 25 equal spaces. When the cylinder was placed in a third liquid, it sank to the 1.150 mark, what is the specific gravity of this liquid? *Ans.* 1.125.

39. One side of a U-tube is filled with glycerine, the other with mercury (density, 13.6). If 17.4 cc. of mercury balance 187.8 cc. of glycerine, what is the specific gravity of the glycerine? *Ans.* 1.26.

40. A cylinder when immersed to a certain depth in water weighed 37.93 grams. When immersed to the same depth in gasoline, it weighed 27.55 grams. What is the relative density of the gasoline? *Ans.* 0.7263.

41. Find the specific gravity of the liquid from the following: Weight of specific gravity bottle, 40.327 grams; weight of specific gravity bottle and water, 143.252 grams; weight of specific gravity bottle and liquid, 108.779. *Ans.* 0.665.

42. Bunsen gives the following data. From it calculate the relative density of calcium. Weight of empty bottle, 13.640 grams; weight of bottle filled with naphtha, 20:275 grams; weight of bottle partly filled with naphtha, 16.650 grams; weight of bottle partly filled with naphtha and calcium, 19.150 grams; weight of bottle full of naphtha and calcium, 21.576 grams; density of the naphtha, 0.758. *Ans.* 1.581.

43. A sample of bronze is made up of 31.50 per cent zinc, 3.00 per cent tin, and 65.50 per cent copper. What is its specific gravity, supposing no change in volume occurred in alloying? (Specific gravities: zinc = 7.142; copper = 8.93; tin = 7.29.) *Ans.* 8.226.

44. A piece of brass weighed 9.0331 grams in water at 4° C. and 10.2531 grams in air. The specific gravity of copper is 8.930 and of zinc 7.142. What is the percentage of copper and of zinc, supposing that these two metals only are present, and that no change of volume took place in alloying?

Ans. 70.97 per cent Cu, 29.03 per cent Zn.

45. An amalgam, consisting of 60.34 per cent mercury (specific gravity, 13.59) and of 39.66 per cent gold (specific gravity, 19.3) shows a specific gravity of 15.47. What is the contraction that has taken place in the formation of a kilogram of the amalgam in totals of the volumes of the two original metals? *Ans.* 0.31 cc.

46. Lupton states, that an alloy of 50 per cent by weight of platinum (specific gravity, 21.5), and 50 per cent by weight of copper (specific gravity, 9.00) has the same color and density as gold (specific gravity, 19.5). What is the contraction in the formation of 50 cc. of the alloy?

Ans. 26.84 cc.

47. The allowance for temperature of 13 per cent to 26 per cent nitric acid is 0.00029 specific gravity for each degree Fahrenheit. (a) Given a sample of acid of specific gravity 1.1154 at 60° F., what is its specific gravity at 45° F.? (b) At 78° F.? (c) What is the weight of 3.4 cubic feet of this acid at 80° F.? (d) What weight of this acid will occupy 10 cubic feet at 42° F.? (e) What is the volume in cubic feet of 100 pounds of this acid at 60° F.? (1 cubic foot of water at 60° F. weighs 62.37 pounds.)

Ans. (a) 1.1197 spec. grav.; (b) 1.1102 spec. grav.;
(c) 235.3 lbs.; (d) 698.9lbs.; (e) 1.437 cu. ft.

48. An acid of a certain concentration was found to have a specific gravity of 1.5281 at 56° F., and a specific gravity of 1.5209 at 72° F. (a) What was the expansion per degree F.? (b) What was the change per degree F. of the specific gravity? (c) Change of strength Bé per degree F.? (d) What is the specific gravity of this acid at 60° F.? (e) The Bé strength of this acid at 60° F.? (f) Assuming the changes of specific gravity and of Bé strength, per degree rise in temperature, to be uniform, what is the specific gravity of the acid at 50° F.? (g) What is the strength Bé at 80° F.?

Ans. (a) 0.0001937; (b) 0.00045; (c) 0.02812° Bé; (d) 1.5263 sp. gr.; (e) 1.5308 sp. gr.; (f) 49.44° Bé.

49. 60° F. is the temperature at which degrees Baumé are tabulated. An acid of a certain concentration changes 0.0235° Bé for each degree change of temperature (Fahrenheit). (a) If the strength Baumé at 42° F. of a sample of this acid is 66.46° Bé, what is the strength Baumé at the temperature of tabulation? (b) What would be the strength Baumé of this acid at 73° F.? (c) If at 60° F., the percentage of acid, corresponding to 66° Bé, is 93.19 per cent and 65.75° Bé corresponds to 91.80 per cent acid, what is the percentage strength of the acid in this sample?

Ans. (a) 66.04° Bé; (b) 65.73° Bé; (c) 93.41 per cent.

50. A sample of sulphuric acid shows a strength of 65.25° Bé at 60° F. How many pounds of this acid in a cubic foot?

Ans. 113.40 lbs.

51. What must be the diameter of a drum to hold 400 pounds of 26° Bé ammonia, length of drum to be 2.5 feet?

Ans. 1.91 ft.

52. Accurate volumetric analysis requires that correction be made for changes of volume of standard solutions with change of temperature. A solution was standardized at 72° F. This solution showed a specific gravity of 1.0277 at 84° F., and of 1.0378 at 40° F. (a) What is the expansion per unit volume per degree Fahrenheit? (b) If a determination was made with this solution at 55° F., using 98.00 cc., what correction must be made to find what the volume would be at 72° F., which is the temperature at which it was standardized? (c) What is the volume, corrected to 72° F.?

Ans. (a) 0.000225; (b) 0.37 cc.; (c) 98.37 cc.

53. What is the Twaddell reading corresponding (a) to 1.6111 specific gravity? (b) To 66° Bé?

Ans. (a) 122.2 Tw.; (b) 167.1 Tw.

54. 141.2° Twaddell corresponds (a) to what specific gravity, and (b) to how many degrees Bé?

Ans. (a) 1.7060 spec. grav.; (b) 60.0° Bé.

55. 50° Bé sulphuric acid contains 62.18 per cent H_2SO_4 and 52° Bé acid contains 65.13 per cent H_2SO_4. (a) To how many pounds of 50° Bé sulphuric acid are 350 cubic feet of 52° Bé acid equivalent? (b) If 60° Bé sulphuric acid contains 77.67 per cent H_2SO_4, to how many pounds of 60° Bé sulphuric acid are 530 cubic feet of 52° Bé acid equivalent?

Ans. (a) 35,647.5 lbs.; (b) 43,216.2 lbs.

56. Calculate the weight of a 60° Bé sulphuric acid that would be equivalent to 2310 cubic feet, measured at 102° F., of a 59.66° Bé acid, the latter being at 80° F. when its Bé strength was determined.

Ans. 243,150 lbs.

57. Calculate the weight of a 50° Bé sulphuric acid that would be equivalent to a shipment of 2,160.61 cubic feet, measured at 120° F., of an acid, a sample of which showed 56.14° Bé at 80° F.*

Ans. 252,410 lbs.

58. It is desired to make a 50 cc. burette, graduated to tenths of a cubic centimeter, the graduations to be 2 mm. apart. What should the diameter of the glass tube be? *Ans.* 0.798 cm.

GAS AND MERCURY THERMOMETERS

The scale of the gas thermometer is the ideal scale and the one now generally adopted. It depends upon the supposition, that an ideal gas will expand for every increase of temperature of one degree, at constant pressure, an equal amount, or, that at constant volume, its pressure will increase equally for every rise in temperature of 1°. An ideal gas will expand $\frac{1}{273}$ of its volume at 0° for every rise of one degree in temperature. The gas used is hydrogen. At high temperatures nitrogen is used.

To have a standard for comparison at all times, hydrogen of such a density, that it would have at 0° a pressure of 1000 mm. mercury was agreed upon as the normal gas. The coefficient of expansion of hydrogen is $a = 0.003663$, that of nitrogen is $a = 0.003675$, between 0° and 100°. The difference, in indication, of the hydrogen and of the nitrogen thermometers between 0° and 100° is 0.01° at the most. This difference increases at low temperatures, but amounts to only 0.6° at −190° (the boiling point of air).

Mercury does not expand uniformly, as gases do, but shows an accelerated expansion as the temperature rises. The same may be said of glass, though different varieties vary in this respect. Evidently, if a glass could be produced that would show the same absolute inequality of expansion as mercury, a mercury thermometer could be made whose readings would agree with those of the gas thermometer.

Mercury thermometers, if the caliber is the same throughout their length, and the ice point, as well as the boiling point, are correctly indicated, will give too high readings between 0° and 100° C. Thermometers vary, depending upon the variety of glass used. The variations from the true readings may reach up to 150° C., 0.5°, up to 250° C., 4°, and up to 350° C., 10°.

At 20° C., for example, thermometers made of Jena glass No. XVI indicate 0.09° too high, while those made of Jena glass No. 59, indicating a variety of glass known as *verre dur*, indicate 0.08 too high.

In tabulating corrections for "tested" thermometers, the latter are compared with the hydrogen thermometer up to 100°, and above this they are

* In commercial transactions, calculations are often carried to a degree of accuracy unwarranted by the accuracy of the readings.

compared with the air thermometer, whose indications up to 100° vary very little from those of the former. Tables are published showing the corrections to be made for various grades of glass.

The scale employed for the thermometers just discussed is the decimal or centigrade scale. However, there are two other scales in use: the Reaumur and the Fahrenheit scale. The centigrade scale is the one adopted by Celsius, and the readings of the instrument, based upon this scale, are often called degrees Celsius.

Celsius called the point at which the mercury in the thermometer constructed by him, stood, when the instrument was placed in melting ice (finely chopped, or grated ice, made into a sort of paste by adding a little distilled water), 0, and he called the point to which the mercury rose when the instrument was placed in the vapors of boiling water, 100, and divided the interval into 100 equal spaces called degrees. This same scale is continued above and below these two fixed points.

Fahrenheit took the prevailing temperature, in Danzig, in the winter of 1709, as the 0 point of his scale, in order always to have positive temperature indications, believing that a lower temperature (than then prevailing) could not be obtained. He marked the point to which the mercury rose when the thermometer was placed into melting ice 32. This boiling point he marked 212. Thus there are 180 degrees on the Fahrenheit scale between the ice point and the boiling point. Reaumur marked the ice point 0 and the boiling point 80, thus making his scale one of 80 degrees.

A comparison of these three scales will readily show the relation of one to the other.

Thus 100° C. = 180° F. = 80° R., and, therefore, to compare the Celsius (C) or the centigrade scale and the Reaumur (R) scale with the Fahrenheit (F) scale, we must first subtract 32° from the reading of the Fahrenheit instrument. Then, we can compare the number of degrees between the melting point of ice and the boiling point of water on the three instruments. Vice versa, when Centigrade or Reaumur degrees are to be converted into Fahrenheit degrees, the ratios 180/100 and 180/80 show only the relation of the scales between the two fixed points, and would give a result 32° too low. For example: ° F. = (180/100) t° C. If t° C. = 100°, then the expression becomes ° F. = 180°. If t° C. = 0, then the expression becomes 0°, in each case 32° below the true marking for the respective temperature.

The temperature of boiling water and consequently that of its vapor varies with the atmospheric pressure. If we know this pressure in millimeters mercury, then we can readily find the boiling point of water, at this pressure, in tables.* The boiling point $t°$ can be found without resource to tables correctly to within one one-hundredth of a degree, between 715 mm. and 770 mm. pressure, for a pressure b, by the aid of the following formula: $t° = 100° + 0.0375° (b - 760)$.

Example. — Let the reduced barometric reading be 750 mm. Then from a table, we find the boiling point of water to be 99.63° at 750 mm. By the above formula: $100° + 0.0375° (750 - 760) = 100 - 0.375 = 99.625°$. If

* See pages 462–468.

the thermometer indicated 99.83°, it indicated 0.20° too high. The correction, at the 100° mark on the thermometer, is, therefore, −0.20°.

The position of the fixed points is subject to change.

1. Position and Pressure. — Thermometers are usually calibrated for use in a vertical position. This fact should be considered when using long, delicate thermometers. In a horizontal position the pressure of the column of mercury (the thread) upon the portion in the bulb is less than when it is in a vertical position, and thus in this position mercury may expand a little more than when the instrument is in its normal position. The amount of this influence of position upon the indication of any particular thermometer is to be found empirically. If the thermometer indicates S degrees higher, in a horizontal position, than in a vertical one, at the same temperature, then the correction will be, for the angle of tilting, Y, $S \sin Y$. The factor S is proportional to the height of the column of mercury. If this column be L mm. long, S will average $1/8000\, L°$ C.

2. Gradual Ascending of the Fixed Points. — Owing to the very gradual contraction of newly blown glass, a process that may continue for years, the volume of the glass of a newly made thermometer slowly shrinks. And so, as the volume of the mercury in the instrument remains constant, the length of the thread produced by the expansion of the mercury becomes longer. The two fixed points are thus raised, and they may be found *as much as one degree higher* than the original corresponding marks.

3. Low Indication, after Exposing a Thermometer to Heat. — Upon being exposed to any definite temperature, glass will not immediately attain the volume which corresponds to that temperature. If a thermometer be kept at a high temperature for any length of time, the ice point and the boiling point may experience a *permanent* lowering of as much as 2° C.

4. Correction for Exposed Thread. — Thermometric scales are based upon the theory that all of the mercury in the instruments has the same temperature. In practice this is rarely the case. If d degrees of the thread of mercury are exposed to a temperature $t'°$ lower than that to be measured, $t°$, and if the length of this exposed portion of the thread were d_0 degrees at 0° C., then this length would be increased by $d_0\, a(t - t')$. No appreciable error is introduced by replacing d_0 by d in this formula. The apparent coefficient of expansion of mercury in glass a (i.e., the difference of the expansion of these two substances) varies with the composition of the glass. For three standard grades of thermometer glass $a = 0.000157$, 0.000163, 0.000158. Thus the formula will read, in the last instance, $d \times 0.000158\,(t - t')$. The mean temperature, $t'°$, is found by the aid of short thermometers that are placed into immediate contact with the long instrument, and whose bulbs are so placed as to be about in the middle of the exposed portion of the thread.

ATMOSPHERIC PRESSURE — BAROMETER

Gravity, increasing from the equator, where its value is 978.1, to mean latitude 45°, where it is 980.6, and from there to the poles, where its value is 983.2, influences atmospheric pressure.

The atmospheric pressure at any one place is subject to constant variations. The pressure reaches a maximum and a minimum twice in twenty-four hours. The times of greatest pressure are from 9 to 11, and of least pressure from 3 to 5, both A.M. and P. M.

The mean atmospheric pressure at sea level is taken as 760 mm. of mercury at 45° latitude. From the equator, either northward or southward, the mean pressure increases to about latitude 30° by 4 to 5 mm., and thence it decreases to about latitude 65°, where the mean atmospheric pressure is less than at the equator, and beyond that it slightly increases. This distribution of pressure in zones is due to the great atmospheric currents.

The extreme variation of atmospheric pressure is very unequal in different latitudes. Within the tropics it rarely exceeds 6 mm., while at 40° latitude, it is more than 50 mm.; at higher latitudes the variation may amount to 76 mm.

The mean atmospheric pressure is not known for a sufficiently large number of places on the earth's surface. So to obtain a basis for comparison, the mean atmospheric pressure at latitude 45° and at sea level, reduced to 0° C. and referred to the value for gravity at 45° latitude, was selected as a standard.

This standard pressure, per square centimeter, is equal to the pressure of a column of mercury of a height of 337.784 Paris lines (1''' of Paris = 2.2558 mm.), or of 762.703 mm., or of 30.028 inches. For scientific purposes a pressure of 760 mm. mercury has been adopted as a standard.

The effective pressure of an atmosphere at sea level, based upon the value of gravity at 45° latitude, is taken as 1033.3 grams per square centimeter in France, and in the other countries using the metric system, while in this country and in England, it is taken as 14.71 pounds per square inch. For general use, excepting for scientific purposes, an atmosphere, equal to a pressure of 1 kilogram per square centimeter, has been adopted and is known as the *new atmosphere.* Instruments for measuring atmospheric pressure are now generally calibrated with this new atmosphere as a basis.

Corrections to be applied to the readings of a barometer. For:

1. Temperature of the Mercury. — Mercury expands 0.000181 of its volume for every increase in temperature of 1° C. If l is the reading of the barometer at $t°$, then the reading l_0 at t_0 degrees will be $l_0 = l - 0.000181\ t.l.$

2. Temperature of the Scale. — The coefficient of expansion β of brass is 0.000019, that of glass is 0.000008. Then the length l_0 of the scale at t_0 will be $l_0 = l - \beta.t.l.$ The combined correction will be the sum of these two corrections: $l_0 = l - (0.000181 - \beta)\ t.l$; $l_0 = l - [0.000181\ t.l + (-\beta.t.l)] = l - (0.000181 - \beta)\ t.l.$

With a brass scale, this correction will be: $(0.000181 - 0.000019) = 0.000162\ l.t.$

With a glass scale, this correction will be: $(0.000181 - 0.000008) = 0.000173\ l.t.$ These latter values may be taken from tables.

This correction will amount, under ordinary barometric conditions, to about 1/8 mm. per degree centigrade, and for general purposes the result will frequently be sufficiently accurate, if 1/8 mm.t be deducted from the barometric reading.

3. Capillary Depression. — This varies with the different instruments. The correction is generally supplied, for any particular instrument, by the manufacturer. The wider the tube of the barometer, the less will be the error due to capillary depression. This correction will amount, at most, to 0.1 mm., where the diameter of the barometer tube is 15 mm.

4. Vapor Pressure of Mercury. — This amounts to 0.001 mm. at 20 °C., and to 0.01 at 40° C. To compensate for the vapor pressure of mercury, it will be sufficient to add to the reading of the barometer 0.001 mm.t.

5. Influence of Gravity. — Reduction to conditions in latitude 45°. The pressure of one and the same column of mercury at different latitudes is proportional to gravity. The pressure of a column of mercury, at sea level, that would be in equilibrium with the pressure of the air would be: At the poles, $983.2 \times 13.596 \times 760$ dynes/cm.², at 45° latitude, $980.6 \times 13.596 \times 760$ dynes/cm.², and at the equator, $978.1 \times 13.596 \times 760$ dynes/cm.²

Thus we see that the specific gravity and the height of the column of mercury remaining the same, the pressure depends upon gravity. Thus, at the equator, the effective pressure is, in the ordinary system of nomenclature, $(978.1/980.6)\ 760 \times 13.596$ grams/cm.², at latitude 45°, it is $980.6/980.6\ (760 \times 13.596)$ grams/cm.², while at the poles it is $983.2/980.6\ (760 \times 13.596)$ grams/cm.²

Thus, to reduce a barometric reading at any latitude other than 45° to that at latitude 45°, we have the following equation: $g/g\ 45° = x$ mm./760 mm., or $760.g/g45°$, or $760\ (1 - 0.0026.\cos 2\phi - 0.0000002\ H)$ = height which a column of mercury would have, under the same atmospheric pressure, at sea level, and at latitude 45°.

This ratio, $g/g45°$, is equivalent to the expression, $1 - 0.0026 \cos 2\phi - 0.0000002\ H$. In this expression ϕ represents the latitude and H the height in meters above sea level. At sea level, H, of course, is equal to 0. The quantity 0.0000002 is a mean that is influenced by the physical properties of the locality. Only at great heights will this last factor, $0.0000002\ H$, be of any account.

GAS CALCULATIONS

Boyle's Law. — The temperature remaining constant, the volume of a true gas varies inversely as the pressure to which it is subjected. Let V be the volume of a gas under a pressure P and let V' be some other volume of the same quantity of the gas and P' its corresponding pressure. The analytical expression of this law is

$$\frac{V}{V'} = \frac{P'}{P} \quad \text{or} \quad PV = P'V'.*$$

* $P'V' = k$, a constant; therefore, on plotting the changes of a given volume of a gas under varying pressure or temperature, an hyperbola results.

Charles' Law. — The pressure remaining constant, the volume of a true gas varies directly as its absolute temperature. Let V be the volume of gas at a temperature T and let V' be some other volume of the same quantity of the gas and T' its corresponding temperature. Then the analytical expression of this law is

$$\frac{V}{V'} = \frac{T}{T'}.*$$

Since 0° C. corresponds to 273° absolute, the law of Charles may be stated as follows. The pressure remaining constant, a true gas expands or contracts $\frac{1}{273}$ of its volume at 0° C. for each degree centigrade rise or fall in temperature.†

Furthermore, the volume remaining constant, the pressure on a gas varies directly as the absolute temperature. Let P be the pressure of a gas at temperature T and let P' be some other pressure on the same quantity of the gas and T' its corresponding temperature. Then the analytical expression of this fact is

$$\frac{P}{P'} = \frac{T}{T'}.$$

The gas thermometer is based upon this law. Thus the pressure exerted by a gas is used as a means of measuring temperature and is employed in the hydrogen thermometer in which the volume is kept constant, and differences of pressure caused by different temperatures are measured. This unit has been chosen for the reason that the expansion coefficient of hydrogen is very uniform over wide ranges of temperature, a property of all gases in a condition far removed from their liquefaction point. Mercury being a liquid does not expand with this regularity with increase of temperature, though at ordinary temperatures the difference of a temperature reading with a hydrogen thermometer and a mercury thermometer is slight.

The laws of Charles and Boyle may be combined in the general formula

$$\frac{PV}{T} = \frac{P'V'}{T'},$$

in which P, V, and T are the original conditions of the gas and P', V', and T' are the changed conditions of the same gas. Then, knowing five of these quantities, the sixth may be obtained by solving the equation.

Vapor Pressure. — Volumes of gases are often measured over liquids which may or may not exert an appreciable vapor pressure. The vapor pressure of a saturated vapor depends only upon the temperature and is independent of the pressure or the presence or absence of an inert gas. If a sufficient amount of a volatile liquid is introduced into the Torricellian vacuum above a mercury barometer or into a barometer tube containing a gas, the

* Note that T and T' are in the absolute scale.

† $\frac{1}{273}$ can be expressed as a decimal. More accurately the coefficient of expansion of a gas is 0.00367, then for $t°$ change this becomes 0.00367 t.

height of the column will be depressed an amount which is independent of all conditions except the temperature. If then the volume of a confined gas is measured over a volatile liquid such as water, the volume will appear greater than the volume of the same amount of the dry gas by an amount corresponding to the vapor pressure of the water (if that is the liquid employed) at that temperature. If this vapor pressure were a constant quantity or increased regularly with the rise in temperature, it would be a very simple matter to correct for it; but such not being the case the vapor pressures corresponding to various temperatures are obtained experimentally and tabulated. In an analytic form these facts are expressed by the equation

$$\frac{V}{V'} = \frac{P - p}{P},$$

in which V and V' are the volumes of the dry and the moist gases respectively, P' the pressure and p the pressure of aqueous vapor at the temperature of observation.

When measuring a liquid over mercury, whether moist or not, a common procedure is to bring the mercury to the same level inside and outside the tube, the atmospheric pressure being measured by a barometer. Under such conditions, the pressure of the confined gas is indicated by the barometer. If it is not convenient to bring the mercury columns to the same level the height of the mercury in the tube must be subtracted from the barometric pressure in order to obtain the pressure on the confined gas. If P' be the reading of the barometer and F the height of the mercury in the tube, V the volume corresponding to the pressure P, and V' the volume of the confined gas, the equation is

$$\frac{V}{V'} = \frac{P' - F}{P},$$

and if V' be measured moist, the volume V of the dry gas is

$$V = \frac{P' - (p + F)}{P} V'.$$

Use of this formula is as follows: It is desired to know the weight W of a liter of air saturated with moisture at 15° C. (T) under a pressure of 754 mm. (P'). The weight of a liter of a gas is given under standard conditions (T = 273° A; P = 760 mm.). Of air this weight is 1.2926 grams (A). The tension of aqueous vapor (P) at 15° C. is 12.76 mm. Substituting in the formula

$$W = \frac{273}{288} \times \frac{754 - \frac{3}{8}\,12.76}{760} \times 1.2926 = 1.2078 \text{ grams.}$$

Again, it is required to find the weight of a liter of oxygen saturated with moisture at 17° C. and under a pressure of 750 mm. (ten. aq. vap. at 17° C. = 14.45 mm.). W' = the weight of the dry oxygen, W'' = the weight of the water vapor.

$$W' = \frac{273}{290} \times \frac{750 - 14.45}{760} \times 32 \times 0.044656 = 1.3019 \text{ gr. } O_2.$$

$$W'' = \frac{273}{290} \times \frac{14.45}{760} \times 18.016 \times 0.044656 = 0.0144 \text{ gr. } H_2O \text{ vapor.}$$

$$W = 1.3019 + .0144 = 1.3163 \text{ gr.}$$

PROBLEMS

The readings in all problems are supposed to be at standard conditions, unless otherwise stated.

59. 200 cc. of a gas is at a pressure of 752 mm. at 15° C. (a) What is its volume under a pressure of 770 mm., the temperature remaining constant? (b) What is its volume, if the temperature is lowered to 10° C., the pressure remaining constant? (c) What is its volume, if the pressure and temperature are changed from 752 mm. and 15° C. to 770 mm. and 10° C.?

Ans. (a) $(752/770) \times 200 = 195.33$ ccm.;
(b) 15° C. = 288° T.; 10° C. = 283° T. $(283/288) \times 200 = 196.53$ ccm.;
(c) $(283/288)\ (752/770).200 = 191.94$ ccm.

60. A barometer graduated at 19.5° C. on a glass scale reads 763.4 mm. (a) What is the reading corrected to 0° C.? (b) If the corrected height of a barometer with a brass scale is 764.7 mm., what does the barometer read at 22° C.? (c) If a barometer with a glass scale reads 754.3 mm. at −10° C., what is the height corrected to standard temperature?

Ans. (a) $763.4/[1 + (0.000181 - 0.000008)\ 19.5°] = 760.9$ mm.;
or (a) $763.4 - (0.000173 \times 763.4 \times 19.5) = 760.9$ mm.;
(b) $x/[1 + (0.000162 \times 22)] = 764.7x = 767.4$ mm.;
(b) $764.7 + (0.000181 - 0.000019) \times 764.7 \times 22 = 767.4$ mm.;
(c) $754.3 - (0.000173 \times 754.3 \times -10) = 755.6$ mm.

61. A gas, at 750 mm. and 12° C., measured moist, occupies 325 cc. (a) What is its volume, dry, under the same conditions? (b) Volume, dry, at standard conditions? (c) 160 cc. of a gas are measured, moist, at 15° C., the barometer (corrected) reads 743 mm. The mercury in the tube stands 150 mm. above the trough what is the volume of the dry gas at standard conditions?

Ans. (a) Tension of aqueous vapor at 12° C. is 10.48 mm.; at 15° C. it is 12.73 mm.;
$(750 - 10.48)/750 = 325/x = 320.46$ cc.;
(b) $V_0 = (750 - 10.48) \times 325 \times 273/285 = 302.93$ cc.;
(b) $V_0 = (739.52 \times 325)/(760 \times 285 \times 0.00367) = 302.93$ cc.;
(c) $V = [743 - (150 + 12.73)]\ 160/[760 \times 288 \times 0.00367] = 115.8$ cc.

62. How many cubic centimeters of nitrogen gas, at standard conditions, can be obtained from a liter of ammonia gas at 15° C. and 780 mm.?

Ans. $2\,NH_3 = N_2 + 3\,H_2$;
2 vol. 1 vol. 3 vol.
Two vol. NH_3 give one vol. N_2, 1 vol. NH_3 (1000 ccm.), gives $\frac{1}{2}$ vol. N_2 (500 ccm.);
$V = (780 \times 500)/760 \times 288 \times 0.00367 = 486.43$ ccm.

63. (a) A liter of sulphur dioxide, at standard conditions, weighs 2.9266 grams. Find its molecular weight. (b) The molecular weight of acetylene is 26.016; what is the weight of 250 cc. of the gas at 18° C. and 757 mm. pressure? (c) If the specific gravity of hydrogen selenide, referred to air, is 2.806, what is its weight per liter? (d) What is its molecular weight?

Ans. (2) $[2.9266/1000) \times 760(1 + at) \times 1]/0.00004463 \times 760 \times (1 + at) \times 1 = 65.5$, or $2.9266 \times 22.393 = 65.5$ or, $2.9266/0.044656 = 65.5$;
$0.044656 \times 26.016/1 = 1.1617$ gr. per L., at standard conditions;
$W_0 = 1.1617 \times 760 \times 1 \times 273/291 = 1.0899$ gr. per L., at 18° C. and 760 mm.;
$W_0 = 1.0856 \times 757/760 = 1.0856$ gr. per L., at 18° C. and 757 mm.;
1.0856 gr. per L. $= 1.0856 \times 0.250$ gr. per 0.250 L. $= 0.2714$ gr.;
$W_{18°} = 0.044656 \times 26.016 \times 757 \times 250 \times 273/760 \times 1000 \times 291 = 0.2714$ gr.
(c) $2.806 \times 1.2926 = 3.627$ gr. per L.;
(d) $2.806 \times 28.943 = 81.21$.

64. (a) If 30.82 ccm. of oxygen (density, to air = 1.1055) effuses through a small orifice in 55 seconds, what volume of hydrogen (density, to air = 0.06965) will effuse in the same time under the same conditions? (b) What volume of sulphur dioxide will effuse through a small orifice in the same time as 83 cc. of ammonia? (c) 150 ccm. of air effuse in the same time as 63.82 ccm. of bromine. What is the molecular weight of the bromine?

Ans. (a) $V^2 : v^2 :: D : d = V = v\sqrt{d/D}$, where V and v indicate velocities. $V = 30.82\sqrt{\dfrac{1.1055}{.06965}} = 123.1$ cc.
(b) The ratio of the densities of sulphur dioxide and of ammonia is the same as the ratio of their molecular weights, then as before:
(b) $v = (83) \times 17.034/64.06 = 42.82$;
(c) $D = V/v = d;\ D = 150/63.82 \times 1 = 5.524$ density referred to air; $5.525 \times 28.943 = 159.9$ density (referred to hydrogen).

65. (a) What volume of oxygen at 18° C. and 754 mm. is liberated by 1.763 grams of potassium chlorate, when completely decomposed? (b) How

much sulphuric acid must be taken to obtain 5.5 cubic feet of hydrogen, at 17° C. and 762 mm., by acting on a metal?

Ans. (a) $2\ KClO_3 = 2\ KCl + 3O_2.$
2 (122.56) gr. 3(22.4) L.

$v = p_0v_0\,(1 + at)/p.$

$v = 760\ (3 \times 22.4)\ 291/273.$ $1.763/2(122.56)$ mol. grams $\times\ v = 0.5193$ L.;

(b) $m.p.v = M.p_0v_0\ (1 + at).$ $H_2SO_4 + M'' = M''\ SO_4 + H_2;$
98.09 oz. 1(22.4) cu. ft.

$M = 98.09 \times 762 \times 5.5 \times 273/760 \times 22.4 \times 290 = 22.73$ oz. (1.42 lbs.).

66. Find the weight, in vacuo, in each of the two following problems: (a) A mass of aluminum (density, 2.583) weighed in air at 18° C. and 742 mm. showed an apparent weight of 149.2350 grams, brass weights (density = 8.4) being used. What is its weight *in vacuo?* (b) A mass of platinum (density, 21.48) weighed in air at 15° C., and 765 mm. with brass weights, showed an apparent weight of 89.4130 grams. Find its weight in vacuo.

Ans. (a) $p_0v_0 = p_0v_0T;\ v_0 = pv/p\ Ta;\ v = m/d = 149.2350/2.583;$
$v = 742 \times (149.2350/2.583) \times 273/760 \times 291;\ 0.0012926 \times v_0 = 0.0684$ gram lost by aluminum.

$V = 742\ \ (149.2350/8.4)\ \ 273/760 \times 291;\ \ 0.0012926 \times v_0 = 0.0210$ gram lost by weights;

$0.0684 - 0.0210 = 0.0474$ grams difference in air displaced;

$149.2350 + 0.0474 = 149.2824$ grams, weight in vacuo.

(b) Using the formula $W = W' + W'd\left(\frac{1}{D} - \frac{1}{D_1}\right),$

$$d = \frac{273}{288} \times \frac{765}{760} \times 0.0012926 = 0.0012333;$$

$$w = 89.4130 + 89.4130 \times 0.0012333\left(\frac{1}{21.48} - \frac{1}{8.4}\right);$$

$$w = 89.4130 + 89.4130 \times 0.0012333\ (0.04656 - 0.11905);$$

$$w = 89.4130 + 89.4130 \times 0.0012333\ (-0.07249);$$

$w = 89.4130 - 0.0080 = 98.4050$ grams *in vacuo.*

67. One liter of a gas is under a pressure of 780 mm. What will be its volume at standard pressure (760 mm.), the temperature remaining constant?
Ans. 1026.3 ccm.

68. 300 ccm. of gas is under standard pressure. What will be its volume at 784 mm., the temperature remaining constant? *Ans.* 290.8 cc.

69. Five cubic feet of a gas are under a pressure of 27.3 ins. of mercury. What is its volume at 29.9 ins., the temperature remaining constant?
Ans. 4.565 cu. ft.

70. A gas occupying a volume of one liter, under standard pressure, is expanded to 1200 ccm. The temperature remaining constant, by how many millimeters must the pressure have been diminished? *Ans.* 126.7 mm.

71. A gas measures 200 ccm. at 15.7° C. Find its volume at 0° C., the pressure remaining constant. *Ans.* 189.12 ccm.

72. One liter of a gas is measured at − 15° C., what is its volume at 15° C., pressure remaining constant? *Ans.* 1116.3 ccm.

73. A gas measured 150 ccm. at 17.5° C., and on account of a change of temperature, the pressure remaining constant, the volume decreased to 125 ccm. What is the new temperature? *Ans.* − 30.9° C.

74. The pressure on a confined gas at 15° C. was 792 mm. If the pressure, later, registered 820 mm., what is the temperature, the volume remaining unchanged? *Ans.* 25.2° C.

75. A liter of gas,, at standard conditions, has its temperature raised to 15° C. What must be the pressure on the gas if the volume is unaltered? *Ans.* 801.7 mm.

76. A gas, measuring 183 ccm. at standard conditions, has its pressure raised to 792 mm. What is the temperature, the volume remaining constant? *Ans.* 11.5° C.

77. 250 ccm. of a gas are at a temperature of 15° C. What is the volume of the gas at 0° C., the pressure remaining constant? *Ans.* 237 ccm.

78. The pressure on a certain volume of hydrogen is 730 mm. at the temperature of melting ice. The volume remaining constant, what is the temperature at a pressure of 750 mm.? *Ans.* 7.5° C.

79. Given 250 ccm. of a gas, under a pressure of 765 mm. and at a temperature of 15° C., what is their volume under standard conditions? (0° C. and 760 mm.) *Ans.* 238.5 cc.

80. 50 cc. of a gas at 780 mm. and at 10° C. changes its volume to 48 cc. under a pressure of 792 mm. What is the temperature at this pressure and volume? *Ans.* 2.9° C.

81. A gas is at a pressure of 748 mm. and at a temperature of 12° C. when its volume is 200 ccm. What must be the pressure of the gas, if its volume is 178 ccm. at a temperature of 0° C.? *Ans.* 805.1 mm.

82. A volume of gas is confined at 0° C. and 760 mm. pressure. What is this pressure (a) in inches of mercury, and (b) in pounds per square inch? *Ans.* (a) 29.921 ins.; (b) 14.701 lbs. per sq. in.

83. A barometer with a glass scale shows a pressure of 752.6 mm. at 15° C. What is the barometer reading at 0° C. corrected for the contraction of the scale? *Ans.* 750.7 mm.

84. A barometer with a brass scale shows a pressure of 768.5 mm. at 18° C. What is the barometer reading at 0° C. corrected for the contraction of the scale? *Ans.* 766.3 mm.

85. The reading of a barometer with a glass scale at −5° C. is 753.2 mm. What is the reading at 0° C.? *Ans.* 753.8 mm.

86. What must be the reading on a barometer with a glass scale at 15° C., so that the pressure, at 0° C., may indicate 760 mm.? *Ans.* 761.9 mm.

87. If sufficient water is placed in a vessel containing a dry gas that is at a temperature of 15° C. and a pressure of 753.8 mm. to thoroughly saturate it, what would be the pressure after saturation,* the temperature remaining constant? *Ans.* 766.53 mm.

88. If the atmosphere is saturated at 14° C. and 758 mm., what percentage by volume of water vapor does it contain? *Ans.* 1.58 per cent.

89. A gas, measured moist, has a volume of one liter, at 17.5° C., under a pressure of 758.9 mm. What is its volume, dry, under standard conditions? *Ans.* 919.9 cc.

90. 300 ccm. of a gas are measured, over water, at 15° C. and under a pressure of 765 mm. (a) What would be the volume of the gas, dry, at this temperature and pressure? (b) What is its volume, dry, under standard conditions? *Ans.* (a) 295.0 cc.; (b) 281.5 cc.

91 A certain reaction produces 22.4 liters of a gas measured at standard conditions. (a) What volume would the moist gas occupy at 18° C. and at standard pressure? (b) At 18° C. and 770 mm.? *Ans.* (a) 24.36 liters; (b) 24.04 liters.

92. 500 ccm. of nitrogen are measured, over water, at 17° C., the barometer reading 750 mm. If the water stood 180 mm. in the tube, what would be the volume of the nitrogen, dry, at standard conditions? *Ans.* 447.07 ccm.

93. 180.5 ccm. of air are saturated with moisture at 18° C. and 620.3 mm. pressure and is measured over mercury, the barometer reading 620.3 mm. The mercury stood 52 mm. in the tube. Find the volume of the air in the dry state and at standard conditions. *Ans.* 123.7 ccm.

94. 203 ccm. of chlorine gas at standard conditions are necessary to decompose a certain amount of hydrobromic acid gas, also at standard conditions. What is the volume of the hydrobromic acid gas? *Ans.* 406 ccm.

95. If to a mixture of 100 ccm. nitrogen and of 200 ccm. oxygen, 500 ccm. of hydrogen are added, and the mixture exploded, (a) what is the resultant volume, if the water is allowed to condense? (b) What is the resultant volume, if the water stays in the gaseous state? *Ans.* (a) 200 cc.; (b) 600 cc.

SUCCESSIVE REACTIONS

When one chemical substance is the means of obtaining another, by means of a series of chemical reactions, that may of themselves be well defined, and it is desired to know the quantity of one of the two requisite to obtain a certain quantity of the other, it is unnecessary to calculate the quantities of the intermediate products. We need to know, only, how many molecules of the one substance are required to produce one molecule of the other. The ratio

* For tension of aqueous vapor see p. 462.

of the molecules and, consequently, that of the molecular weights being given, the ratio of the weights of the substances under consideration is readily obtained.

For example, we wish to know the amount of ammonia involved in the production of one ton of anhydrous sodium carbonate by the Solvay process. The reactions involved are:

$$2\,NH_3 + 2\,H_2O + 2\,CO_2 = \underline{2\,NH_4HCO_3};$$
$$2\,NaCl + 2\,NH_4HCO_3 = \underline{2\,Na\,HCO_3} + 2\,NH_4Cl;$$
$$2\,NaHCO_3 = \underline{Na_2CO_3} + H_2O + CO_2.$$

From these equations, in which the underscored compounds are successively converted one into the other, we see that 2 molecules of ammonia are required to produce one molecule of sodium carbonate. The ratio of the molecules is:

$$2\,NH_3/Na_2CO_3 = 2\,(17.03)/106 = 34.06/106,$$

and the ratio of the weights of the two substances is:

X tons NH_3/1 ton Na_2CO_3 34.06/106 = $X/1$, X = 0.3213 tons, or 642.6 pounds.

FACTORS

In gravimetric analysis the term *factor* represents the numerical value of a ratio.

1. The factor of an element (sought), or of a group of elements (sought), forming part of one molecule, is the weight in grams of the element, or group of elements, contained in one gram of the substance of whose molecule they form a part.

2. The factor of the molecule of one of two chemically equivalent molecules represents the weight in grams of the molecule (sought), contained in one gram of the other equivalent molecule.

Examples to Illustrate. — Factor of SO_3 in $BaSO_4$ = molecular weight SO_3: molecular weight $BaSO_4$ = 80.06: 233.46 = 80.06/233.46 = 0.3430, i.e., 0.3430 grams of SO_3 are contained in 1 gram of $BaSO_4$.

Factor of S in $BaSO_4$ = atomic weight S: molecular weight $BaSO_4$ = 32.07: 233.46 = 32.07/233.46 = 0.13738, i.e., 0.13738 grams of S are contained in 1 gram of $BaSO_4$.

Factor of $Mg_2P_2O_7$ corresponding to $MgCl_2 \cdot 6\ H_2O$ = molecular weight $Mg_2P_2O_7$: 2 (molecular weight $MgCl_2 \cdot 6\ H_2O$) = 222.64: 2 (203.34) = 224.64/406.68 = 1.8266, i.e., 1.8266 grams of $Mg_2P_2O_7$ correspond to 1 gram of $MgCl_2 \cdot 6\ H_2O$.

"ASSAY-TON" SYSTEM

This system was devised by Prof. Charles W. Chandler of Columbia University. It saves long calculations in reporting the results of an assay of the ores of gold or silver, obtained in grams, the results being required in ounces Troy per ton of 2000 pounds avoirdupois. If an "assay ton," or 29.1666

grams, is used, the result in gold or silver, as weighed in milligrams, is ounces per ton, without any further calculation.

The "assay ton" is derived as follows: One pound avoirdupois contains 7000 grains. One ton, 2000 pounds, contains 14,000,000 grains. One ounce Troy contains 480 grains. 14,000,000/480 = 29,166.6, or the number of Troy ounces in one ton. Thus, if we take this number of milligrams (29,166.6) of ore for an assay, each milligram of gold or silver found is equivalent to an ounce Troy in one ton of the ore.

Proof. — 1 mg.: 29,166.6 mg.: 480 grains (1 ounce Troy): 14,000,000 grains (1 ton Avoirdupois).

PROBLEMS

96. Given the reaction:

$$\underset{(278.02)}{PbCl_2} + K_2CrO_4 = \underset{(323.1)}{PbCrO_4} + 2\,KCl;$$

(a) What is the factor of lead chloride to lead chromate? (b) If 0.1784 grams of lead chromate are precipitated by an excess of potassium chromate from a solution containing lead chloride, how many grams of lead chloride were present? (c) How many grams of lead chromate are obtained from one gram of lead chloride? (d) How many grams of lead in 0.7325 grams of lead chromate? *Ans.* (a) $PbCl_2/PbCrO_4 = 278.02/323.1 = 0.8604$;
(b) $0.1784 \times 0.8604 = 0.1535$ gr. $PbCl_2$;
(c) $1/0.8604 = 1.1622$ gr. $PbCrO_4$;
(d) $Pb/PbCrO_4$, $207.1/323.1 = x/0.7325 = 0.4695$ gr. Pb.

97. Hydrous sodium carbonate may be converted into the anhydrous salt by heat according to the equation,

$$\underset{286.16}{Na_2CO_3 \cdot 10\,H_2O} = \underset{106.00}{Na_2CO_3} + \underset{180.16}{10\,H_2O}.$$

(a) How many pounds of anhydrous sodium carbonate may be obtained from 15 pounds of the crystallized salt? (b) What is the factor of hydrous sodium carbonate to anhydrous sodium carbonate? (c) If 17 pounds of hydrous sodium carbonate are converted into the anhydrous form, what is the loss in weight?

Ans. (a) $(Na_2CO_3/Na_2CO_3 \cdot 10\,H_2O)$ $106.0/286.16 = x/15$
$x = 5.5214$ lbs. Na_2CO_3;
(b) $Na_2CO_3 \cdot 10\,H_2O/Na_2CO_3 = 2.6996$;
(c) The loss in weight is the water driven off. This problem may be solved in two ways: By using the factor found in (b), or by calculating the water directly.
$17/2.6996 = 6.2973$ lbs. Na_2CO_3 remaining;
$17.000 - 6.2973 = 10.703$ lbs. water driven off;
$10\,H_2O/Na_2CO_3 \cdot 10\,H_2O = (180.16/286.16)17 = 10.703$ lbs. water driven off.

98. Sulphuric acid is made according to the equation

$$2\,S + 3\,O_2 + 2\,H_2O = 2\,H_2SO_4.$$

(a) If brimstone containing 97.00 per cent sulphur is used, how much sulphuric acid is obtained from one ton? (b) If pyrites containing 96 per cent FeS_2 is used to furnish the sulphur, how many tons are required to yield a ton of sulphuric acid? *Ans.* (a) 2.9667 tons; (b) 0.6371 tons.

99. (a) What is the percentage of manganese in pure potassium permanganate? (b) In potassium permanganate containing 2 per cent impurities? *Ans.* (a) 34.76 per cent; (b) 34.06 per cent.

100. Potassium antimonyl tartrate (tartar emetic) corresponds to the formula $K_2H_2\,(C_4H_4O_6)_2 \cdot Sb_2O_3$. (a) What are the percentages of the different elements in this compound? (b) What is the percentage of Sb_2O_3? (c) Five gram of antimony are contained in how many grams of tartar emetic?

Ans. (a) K = 11.76 per cent, H = 1.52 per cent, C = 14.44 per cent, O = 36.11 per cent, Sb = 36.17 per cent;
(b) 43.39 per cent;
(c) 13.8245.

101. How many grams of chromic sulphide will be formed from 0.7182 gram of chromic oxide according to the equation:

$$2\,Cr_2O_3 + 3\,CS_2 = 2\,Cr_2S_3 + 3\,CO_2?$$

Ans. 0.9460 gr.

102. What is the factor for the conversion $Mg_2P_2O_7$ to P_2O_5? (b) How many grams of phosphoric anhydride are contained in 0.7256 grams of magnesium pyrophosphate? (c) What is the factor for the ratio conversion $(NH_4)_3PO_4 \cdot 12\,MoO_3$ to P_2O_5? (d) How many grams of phosphoric anhydrids are equivalent to 0.1500 gram of ammonium phosphomolybdate?
Ans. (a) 0.63793; (b) 0.46288 gr.; (c) 0.03784; (d) 0.0056765 gr.

103. Iodine may be obtained from potassium iodide according to the equations

$$NaCl + H_2SO_4 = NaHSO_4 + HCl,$$
$$4\,HCl + MnO_2 = MnCl_2 + 2\,H_2O + Cl_2,$$
$$Cl_2 + 2\,KI = 2\,KCl + I_2.$$

How much sodium chloride must be taken to produce 5 grams of iodine?
Ans. 4.606 gr.

104. The LeBlanc process for the manufacture of sodium carbonate is

$$2\,NaCl + H_2SO_4 = Na_2SO_4 + 2\,HCl.$$
$$Na_2SO_4 + 2\,C = Na_2S + 2\,CO_2,$$
$$Na_2S + CaCO_3 = Na_2CO_3 + CaS.$$

How many tons of sodium carbonate may be obtained from a ton of salt?
Ans. 0.9066 tons.

105. From the equations,

$$AlCl_3 + 3\,NH_4C_2H_3O_2 = Al(C_2H_3O_2)_3 + 3\,NH_4Cl,$$
$$Al(C_2H_3O_2)_3 + H_2O = Al(OH)\cdot(C_2H_3O_2)_2 + HC_2H_3O_2,$$
$$2\,Al(OH)\cdot(C_2H_3O_2)_2 + 8\,O_2 = Al_2O_3 + 7\,H_2O + 8\,CO_2:$$

(a) How many grams of aluminum chloride are required to yield 0.3 gram of aluminum oxide? (b) How many grams of aluminum oxide are obtained from 0.8300 gram of aluminum chloride?

Ans. (a) 0.7836 gr.; (b) 0.3177 gr.

106. Sulphuric acid reacts with sodium hydroxide thus,

$$H_2SO_4 + 2\,NaOH = Na_2SO_4 + 2\,H_2O.$$

If 0.2073 grams of sulphuric acid are added to 0.1705 grams of sodium hydroxide, (a) how much sodium sulphate is formed and (b) which is left over, caustic alkali or acid, and how much?

Ans. (a) 0.3003 gr.; (b) 0.0014 gr. NaOH.

107. What are the percentages of the elements in ammonium phosphomolybdate $(NH_4)_3PO_4 \cdot 12\,MoO_3 \cdot 3\,H_2O$?

Ans. N = 2.18 per cent; O = 35.63 per cent; H = 0.93 per cent; Mo = 59.65 per cent; P = 1.61 per cent.

108. Regarding ammonium phosphomolybdate as made up of the radicals (NH_3), (H_2O), (P_2O_5), and MoO_3, what is the percentage composition of these radicals in the molecule?

Ans. P_2O_5 = 3.69 per cent; H_2O = 4.20 per cent; NH_3 = 2.65 per cent; MoO_3 = 89.47 per cent.

109. Chrome iron ore is Cr_2O_3FeO, and may be converted into potassium dichromate as follows:

$$4\,FeOCr_2O_3 + 4\,K_2CO_3 + 4\,CaO + 7\,O_2 = 4\,K_2CrO_4 + 4\,CaCrO_4 + 2\,Fe_2O_3 + 4\,CO_2.$$

The calcium chromate is converted into potassium chromate,

$$CaCrO_4 + K_2SO_4 = CaSO_4 + K_2CrO_4,$$

and potassium dichromate is obtained from the potassium chromate,

$$2\,K_2CrO_4 + H_2SO_4 = K_2SO_4 + H_2O + K_2CrO_4 \cdot CrO_3.$$

How many tons of potassium dichromate can be obtained from a ton of chrome iron ore, if the conversion is complete, and the ore is 92 per cent $FeCr_2O_4$? *Ans.* 1.2089 tons.

110. Sulphur dioxide may be produced by the reaction,

$$Cu + 2\,H_2SO_4 = CuSO_4 + 2\,H_2O + SO_2.$$

(a) How much copper and (b) how much of a 93.2 per cent H_2SO_4 must be taken to obtain 64 grams of sulphur dioxide?

Ans. (a) 63.50 gr.; (b) 210.3 gr.

111. How much superphosphate can be made from one ton of calcium phosphate, 93.5 per cent pure? The reaction is

$$Ca_3(PO_4)_2 + 2\,H_2SO_4 = 2\,CaSO_4 + CaH_4(PO_4)_2.$$

Ans. 0.7056 tons.

OLEUM ANALYSIS

When an oleum contains free sulphurous anhydride, an interesting and important case of indirect volumetric analysis results. Such an oleum contains sulphuric acid, sulphuric anhydride, and sulphurous anhydride. (There may be other impurities, such as solid particles, etc., but for these calculations, only the three constituents enumerated will be considered as being present. The method is easily extended so as to cover other impurities.) A weighed sample is dissolved in water and titrated with a standard alkali when all the constituents are acted upon as follows:

$$H_2SO_4 + 2\,NaOH = Na_2SO_4 + H_2O; \quad SO_3 + H_2O = H_2SO_4;$$
$$H_2SO_3 + 2\,NaOH = Na_2SO_3 + H_2O; \quad SO_2 + H_2O = H_2SO_3.$$

The following is a typical example of an oleum analysis: Exactly 5 grams of an oleum are dissolved in water, and the volume is then made up to 500 cc. Of this solution 100 cc., equivalent to 1 gram of the sample, are titrated with N/10 iodine solution, of which 7.80 cc. are required. A similar portion is titrated with N/5 sodium hydroxide, using phenolphthalein* as the indicator, 122.81 cc. being required. To calculate the composition of the oleum:

1 mol. SO_2 (64.06) requires 1 mol. I (253.70), or 64.06/253.70;

1 cc. N/10 Iodine sol. $= 1$ cc. N/10 $SO_2 = \times \dfrac{64.06}{2 \times 10} \times \dfrac{1}{1000} = 0.003203$ gr. SO_2;

hence, 7.8 cc. Iodine N/10 $= 7.8 \times 0.003203 = 0.02498$ gr. $SO_2 = 2.5$ per cent SO_2;

122.81 N/5 solution = 245.62 cc. N/10 solution;

245.62 − 7.80 = 237.82 cc. N/10 NaOH;

required for the titration of the sulphuric acid, and the sulphur trioxide. (The 7.80 cc. are subtracted, this being the number of cc. of N/10 solution of sodium hydroxide used in neutralizing the sulphuric acid. If methyl orange had been used 253.42 cc. (254.62 + 7.80) of N/10 sodium hydroxide would have been required for the total acidity titration. Then 15.6 cc. (7.8 cc. to form $NaHSO_3$ and 7.8 cc. to form from this, Na_2SO_3) of N/10 solution would have had to be deducted from the 253.42 cc. N/10 sodium hydroxide that would have been required for the total acidity, leaving 237.82 cc. to take up the sulphuric acid and the sulphuric acid anhydride as before.)

* Using phenolphthalein the following reaction takes place, $H_2SO_3 + 2\,NaOH = Na_2SO_3 + H_2O$ while with methyl orange the acid salt will be formed as follows: $H_2SO_3 + NaOH = NaHSO_3$.

80.08 g. $SO_3/2 \times 1000$ cc. nNaOH $= 40.04/1000$ cc. nNaOH
$= X$ g. $SO_3/237.82 = 95.21$ per cent total SO_3.
95.21 per cent $+ 2.50$ per cent $= 97.71$ per cent, $SO_2 + SO_3$.
100.00 per cent $- 97.71$ per cent $= 2.29$ per cent H_2O.
98.09 g. $H_2SO_4/18.016$ g. $H_2O = X$ per cent $H_2SO_4/2.29$ per cent H_2O
$= 12.47$ per cent H_2SO_4.

100.00 per cent (of the oleum) $-$ (12.47 per cent H_2SO_4 + 2.50 per cent SO_2) = 85.03 per cent free SO_3 and so the oleum is composed of H_2SO_4 = 12.47 per cent, SO_3 = 85.03 per cent, SO_2 = 2.50 per cent $-$ 100.00 per cent.

To calculate this problem algebraically, let x = percentage of H_2SO_4, y = percentage of SO_3, z = percentage of SO_2, A = total acidity, as H_2SO_4, f = factor, $H_2SO_4/SO_3 = 98.09/80.07 = 1.22505$.

Then,

$$x + y + z = 100, x + y = 100 - z, x = 100 - (y + z).$$

From the conditions of the problem:

$x + y = 100 - z$, $x + fy = A$. $x = A - fy$. Substituting in first equation, $A - fy + y = 100 - z$, or $fy - y = - 100 + z + A$, $y (f - 1) = A + z - 100$, $y = (A + z - 100)/(f - 1) = (A + z - 100)/0.22505 = 4.4436 (A + z - 100)$.

Solving the problem given by this method:

Since z = 2.50 per cent (as before),
A = 237.82 cc. n/10 NaOH = 116.64 per cent H_2SO_4.
y = 4.4436 (116.64 per cent + 2.50 per cent $-$ 100.00 per cent
= 4.4436 $\times$ 19.14 = 85.05 per cent.
x = 100.00 per cent (2.50 per cent + 85 per cent) = 12.45 per cent.

The result of the analysis then is:

12.45 per cent H_2SO_4, 85.05 per cent SO_3, 2.50 per cent SO_2 (= 100.00 per cent).

DILUTION AND CONCENTRATION OF LIQUIDS, OF MIXTURES, AND FORMATION OF ALLOYS OF DEFINITE COMPOSITION, ETC.

The course of reasoning, in each instance, will be analogous, if not the same. For the sake of simplicity liquids alone will be considered.

(1) **Preparation of a definite amount of a dilute solution** by diluting a strong solution of a substance with water or with a weak solution of the same substance.

General Discussion. — Let x be the weight in grams of the solution to be diluted, and let A be the number of grams of substance dissolved in 100 grams of this solution. *This ratio of A grams to* 100 *grams of solution is called the concentration.* The solution then is an A per cent solution. *Water* containing nothing of the substance dissolved in it, *is* therefore, *in respect to the substance a* 0 *per cent solution.*

Argument. — X = weight in grams of the solution of A per cent concentration that is to be diluted with a quantity of solution of B per cent concentration to form Z grams of a solution of D per cent concentration. $Z - X$ = weight in grams of the solution of B per cent concentration, that, if mixed with X grams of the A per cent solution, will form Z grams of a D per cent solution.

$(A/100)\,X$ = weight, in grams, of substance dissolved in X grams of the A per cent solution.

$(B/100)\ (Z-X)$ = weight, in grams, of substance dissolved in $Z-X$ grams of the B per cent solution.

$(D/100)Z$ = weight, in grams, of substance dissolved in Z grams of the D per cent solution.

(2) **Dilution of a definite amount of solution,** thus producing a greater amount than this of a more dilute solution.

X = weight, in grams, of the B per cent solution to be added to Z grams of the solution, to be diluted, of A per cent concentration, to form of these $Z + X$ grams of a weaker solution, a D per cent solution.

AZ = weight in grams of the substance dissolved in Z grams of the A per cent solution.

BX = weight in grams of the substance dissolved in X grams of the B per cent solution.

$D(Z + X)$ = weight in grams of the substance dissolved in $Z + R$ grams of the D per cent solution.

$AZ + BX = DZ + DX$, $\underline{X = Z\,(A - D)/(D - B)}$.

Where we dilute with water, the B per cent solution, as before, is in fact a 0 per cent solution, and the expression becomes:

$$X = Z\,(A - D)/(D - O), \quad X = Z\,(A - D)/D.$$

Example 1. — How many pounds of water must be added to 800 pounds of a 73 per cent H_2SO_4 to make of the whole a 70 per cent H_2SO_4? Dilution with water.

$$X = 800(73 - 70)/70 = 34.39 \text{ pounds of } H_2O.$$

How much water must be added to 1000 cc. of a 0.1128 N solution to make a 0.1 N solution? *As a* N/10 *solution has practically a density of one, the numbers indicating normality may be taken as volumes. To be very accurate the corresponding weights should be taken.*

$$X = 1000\,(0.1128 - 0.1000)/0.1000 = 128 \text{ cc. } H_2O.$$

Example 2. — How many pounds of a 62.18 per cent H_2SO_4 must be added to 1000 pounds of a 98 per cent H_2SO_4 to make of the whole a 93 per cent H_2SO_4?

$$X = 1000\,(98 - 93)/(93 - 62.18) = 162.2 \text{ pounds } 62.18 \text{ per cent } H_2SO_4.$$

Example 3. — How much 0.1012 N solution must be added to 1000 cc. of a 0.5009 N solution to make a 2 N/10 solution?

$$X = 1000(0.5009 - 0.2000)/(0.2000 - 0.1012) = 3045.5 \text{ cc. of a } 0.1012 \text{ N solution.}$$

(3) **Preparation of a definite amount of a stronger solution,** from a weak solution, by the addition of a solution of a higher concentration than that of either of the two solutions on hand.

Let X = weight in grams of the C per cent solution, the one that will be diluted by mixing with a quantity of a solution of A per cent concentration necessary to make Z grams of a solution, stronger than the A per cent solution, and of a D per cent concentration.

$Z - X$ = weight of the solution of A per cent concentration, that, together with X grams of the C per cent solution, will give Z grams of a D per cent solution.

$$CX + A\,(Z - X) = DZ,\ X\,(C - A) = Z\,(D - A),\ X = Z\,(D - A)/(C - A).$$

Example 1. — How many pounds of an 80 per cent acetic acid and of a 60 per cent acetic acid must be mixed to make 500 pounds of a 65 per cent acetic acid.

X	$= 500\,(65 - 60)/(80 - 60)$	= 125 pounds	80 per cent acetic acid.
$Z - X$	$= 500 - 125$	= 375 pounds	60 per cent acetic acid.
$X + (Z - X) =$		= 500 pounds	65 per cent acetic acid.

Example 2. — How many cubic centimeters of a 0.0957 N and a 0.1120 N solution must be taken to make 1000 cc. of a 0.1 N solution.

$X = 1000\,(0.1000 - 0.0957)/(0.1120 - 0.0957) =$ 263.8 cc. of the 0.112 N solution.

$Z - X =$ = 736.2 cc. of the 0.0957 N solution.

$X + (Z - X) =$ = 1000 cc. N/10 solution.

(4) **Concentration of a definite amount of solution,** by the addition of a more concentrated solution of the same substance, thus producing a greater amount of a concentrated solution.

Let X = weight of the solution of C per cent concentration, that will be diluted by adding it to Z grams of an A per cent solution, necessary to make a quantity $Z + X$ grams of a solution, stronger than the A per cent solution, and of a D per cent concentration.

$$CX + AZ = D\,(Z + X), X\,(C - D) = Z\,(D - A), X = Z\,(D - A)/(C - D).$$

Example. — How many pounds of an 80 per cent H_2SO_4 must be added to 980 pounds of a 35 per cent H_2SO_4, to strengthen the whole to a 40 per cent acid.

$X = 980\,(40 - 35)/(80 - 40) =$ 122.5 pounds 80 per cent H_2SO_4.

FORMATION OF MIXTURES OF DEFINITE COMPOSITION

(1) Suppose we have two lots of soap powder in stock, one containing 25 per cent of soap, and the other 50 per cent of soap. We desire to make a soap powder containing 40 per cent of soap, for which we have an order calling for

1000 pounds. How many pounds of each of our stock powders must we mix to fill the order?

One lot contains 15 per cent less soap than the desired mixture, the other 10 per cent more. So if we take 15 parts of the richer mixture to 10 parts of the poorer one, we shall have a powder containing 40 per cent soap.

$$15/25 = x/100 = 60/100 = 60 \text{ per cent.}$$
$$10/25 = y/100 = 40/100 = 40 \text{ per cent.}$$

60 per cent of 1000 pounds of the final mixture must be 600 pounds of the 50 per cent mixture.
40 per cent of 1000 pounds of the final mixture must be 400 pounds of the 25 per cent mixture.
600 pounds of the 50 per cent mixture contain 300 pounds of soap.
400 pounds of the 25 per cent mixture contain 100 pounds of soap.

Therefore, 1000 pounds of this 40 per cent mixture contain 400 pounds of soap as required.

(2) Problems of this character may also be solved as follows:

There are on hand two portions of iron, one containing 0.1 per cent of carbon while the other contains 0.25 per cent of carbon. How many pounds of each must be melted together to produce 1000 pounds of an iron containing 0.2 per cent of carbon.

Let x be the weight in pounds of the 0.25 per cent carbon iron, then $1000 - x$ is the weight required of the 0.1 per cent carbon iron in pounds. 0.25 per cent of x + 0.1 per cent of $(1000 - x)$ = 0.2 per cent of 1000. $0.0025\,x + 0.001\,(1000 - x) = 0.002 \times 1000$. $x = 666.67$ or 666.67 pounds of the 0.25 per cent carbon iron, and 333.33 pounds of the 0.1 per cent carbon iron are required to produce 1000 pounds of an iron containing 0.2 per cent carbon.

FORMATION OF MIXTURES OF SULPHURIC AND NITRIC ACIDS OF DEFINITE COMPOSITION (SO-CALLED "MIXED ACIDS")

"Mixed acid" is a commercial term, generally meaning a mixture of nitric and sulphuric acids. Such mixtures are extensively used in manufacturing processes. On account of the relatively high cost of concentrated nitric acid, compared with that of the dilute acid, the concentrated acid is diluted with a weak solution of the acid, instead of with water, using a minimum quantity of concentrated and a maximum quantity of dilute nitric acid. The sulphuric acid is added as 98 per cent acid, as here it is practically impossible to ship the dilute acid, it being a question of containers. *Concentrated* sulphuric acid hardly attacks iron, and so it can be readily shipped in iron drums or tanks.

Example 1. — A waste mixed acid left over from nitrating is composed of 60.12 per cent H_2SO_4, 20.23 per cent HNO_3 and 19.65 per cent H_2O. It is required to make a mixture of 1000 pounds, containing 60 per cent H_2SO_4, 22.5 per cent HNO_3, and 17.5 per cent H_2O. A 97.5 per cent H_2SO_4 and a

90.5 per cent HNO_3 are on hand. How many pounds of each of these two acids and of the waste acid must be taken to make the required mixture without adding any water?

Solution. — Let x be the weight of the waste acid, y the weight of 97.5 H_2SO_4 added, and z the weight of 90.5 per cent HNO_3 added.

Then x (0.6012) = weight of H_2SO_4 (100 per cent) in the waste acid, y (0.975) = weight of H_2SO_4 (100 per cent) actually added, when adding the 97.5 per cent acid, x (0.2023) = weight of HNO_3 (100 per cent) in the waste acid, z (0.905) = weight of HNO_3 (100 per cent) actually added, y (0.025) = weight of H_2O contained in the H_2SO_4 (97.5 per cent), that was added, z (0.095) = weight of H_2O, contained in the HNO_3 (90.5 per cent), that was added, x (0.1965) = weight of H_2O, in the waste acid.

One thousand pounds of the desired mixture must evidently contain 601.2 pounds H_2SO_4, 202.3 pounds HNO_3, and 196.5 pounds H_2O. Therefore, we have the following equations:

(1) $x\,(0.6012) + y\,(0.975) = 600$ pounds H_2SO_4.
(2) $x\,(0.2023) + z\,(0.905) = 225$ pounds HNO_3.
(3) $x\,(0.1965) + y\,(0.025) + z\,(0.095) = 175$ pounds H_2O.

$$y = (600 - x\,0.6012)/0.975 = 615.38 - x\,(0.61662).$$
$$z = (225 - x\,0.2023)/0.905 = 248.62 - x\,(0.22353).$$

Substituting these two equations in equation (3), we obtain:

$$0.1965 + 15.38 - 0.01542\,x + 23.62 - 0.02124\,x = 175.00.$$
$$0.15984x = 136,\quad x = 850.85 \ldots\ldots\ldots\ldots = 850.85 \text{ pounds of waste acid.}$$

Substituting in equation (1):

$y = (600 - 511.53)/0.975 = 90.74$ .... = 90.74 pounds H_2SO_4 95.7 per cent.

Substituting in equation (2):

$z = (225 - 172.13)/0.905$ .... = 58.41 pounds HNO_3 90.5 per cent.

1000.00 pounds mixture.

Example 2. — It is desired to make a "mix" consisting of 60,000 pounds of a mixed acid to consist of 46 per cent H_2SO_4, 49 per cent HNO_3 and 5 per cent water. The H_2SO_4 is to be added in the form of 98 per cent acid, the HNO_3 in the form of 61.4 per cent and 95.5 per cent acid.

Solution.

$60{,}000 \times 0.46 = 27{,}600$ pounds H_2SO_4 are required.
$60{,}000 \times 0.49 = 29{,}400$ pounds HNO_3 are required.
$60{,}000 \times 0.05 = 3{,}000$ pounds H_2O are required.

$$\frac{27{,}600}{10.98} = 28{,}163 \text{ pounds 98 per cent } H_2SO_4 \text{ required.}$$

60,000 − 28,163 = 31,837 pounds of a mixture of concentrated and dilute nitric acid to be added to the 28,163 pounds of the 98 per cent H_2SO_4 to complete the required mixture.

Let

$$x = \text{number of pounds of 95.5 per cent } HNO_3 \text{ to be added.}$$

Then

$$31.837 - x = \text{number of pounds of 61.4 per cent } HNO_3 \text{ to be added.}$$

Then

$$0.955x + 0.614\,(31{,}837 - x) = 29{,}400,$$

and solving

x = 28,891 pounds of 95.5 per cent HNO_3 to be taken.
31,837 − 28,891 = 2946 pounds of 61.4 per cent HNO_3 to be taken.

So to make the "mix," take:

28,163	pounds 98 per cent H_2SO_4
28,891	pounds 95.5 per cent HNO_3
2,946	pounds 61.4 per cent HNO_3
60,000	pounds total.

This same result might have been reached by means of the formulæ given to adjust the strengths of acids (1) to (4) page 556, according as to whether the acid is to be diluted or is to be strengthened. 29,400 pounds of absolute nitric acid are called for. The weight of nitric acid to be added, after the 98 per cent sulphuric acid is added, is 31,837 pounds, as before. We obtain the concentration of this acid as follows:

29,400/31,837 = x/100; x = 92.35 or the 29,400 pounds absolute nitric acid, if added to the 31,837 pounds of 98 per cent H_2SO_4, would produce a 92.35 per cent HNO_3 solution that would be mixed with the 98 per cent H_2SO_4 solution.

To make 31,837 pounds of a 92.35 per cent HNO_3 solution from a mixture of 95.5 per cent and 61.4 per cent nitric acids, employing formula (3) p. 558, we proceed as follows:

(92.35 − 61.4)/(95.50 − 61.4) = x/31,837 x = 28,896 pounds 95.5 per cent HNO_3 to be taken.

31,837 − 28,896 = 2941 pounds 61.4 per cent HNO_3 to be taken.

Example 3. — An example, involving the use of oleum, will now be considered: It is required to make 61,320 pounds of a mixed acid of the composition,

56 per cent HNO_3 (add as 94.5 per cent HNO_3), 41 per cent H_2SO_4 (add as 98.56 per cent H_2SO_4 and as 20 per cent oleum), and 3 per cent H_2O.

The tank in which the acid is to be mixed already contains 2604 pounds of the remains of a previous "mix" of the composition,

52 per cent HNO_3, 42.50 per cent H_2SO_4 and 5.5 per cent H_2O.

Solution.

61,320 × 0.56 = 34,339 pounds HNO_3, 61,320 × 0.41 = 25,141 pounds H_2SO_4, 61,320 × 0,03 = 1840 pounds H_2O.

$2604 \times 0.52 = 1354$ pounds HNO_3, $2604 \times 0.4250 = 1107$ pounds H_2SO_4, $2604 \times 0.055 = 143$ pounds H_2O.

Thus we have:

Required:	25,141 pounds H_2SO_4,	34,339 pounds HNO_3,	1840 pounds H_2O;
In tank:	1,107 pounds H_2SO_4,	1,354 pounds HNO_3,	143 pounds H_2O;
To be added:	24,034 pounds H_2SO_4,	32,985 pounds HNO_3,	1697 pounds H_2O.

$24{,}034/0.9856 = 24{,}385$ pounds 98.56 per cent H_2SO_4 required.

(In attempting to work out the amounts requisite, by the previous method, it will be seen that the method will not work, for the reason that too much water would be introduced. The 24,385 pounds of 98.56 per cent sulphuric acid given above is a provisional figure that will have to be modified later.)

$24{,}385 - 24{,}034 = 351$ pounds H_2O that were added with the 98.56 per cent H_2SO_4.

$1{,}697 - 351 = 1346$ pounds H_2O still to be added.

Adding this water with the nitric acid, would call for a stronger nitric acid, than the 94.5 per cent nitric acid on hand:

$32{,}985\ (HNO_3) + 1346\ (H_2O) = 34{,}331$ pounds $HNO_3 + H_2O$ still to be added.

$32{,}985/34{,}331 = x/100/x = 96.08$ or a 96.08 per cent HNO_3 would be required.

Oleum will be required to take up this water.

$32{,}945/0.945 = 34{,}905$ pounds 94.5 per cent HNO_3 are required.

$34{,}905 - 32{,}985 = 1920$ pounds H_2O added with the 94.5 per cent HNO_3.

$1920 - 1697 = 223$ pounds H_2O added in excess.

These 223 pounds of water must be taken up by the 20 per cent oleum which will require 4955 pounds 20 per cent oleum.

$80\ (SO_3)/18\ (H_2O) = x/223 = 991$ pounds free SO_3, and this is contained in 4955 pounds, $991/20 = x/100 = 4955$ pounds.

But as 85.31 is the percentage total of SO_3 in 20 per cent oleum, and as 81.63 is the percentage total of SO_3 in 100 per cent sulphuric acid, 20 per cent oleum is equivalent to 104.5 per cent H_2SO_4.

$85.31/81.63 = x/100 = 104.5$ per cent.

The addition of these 4955 pounds 20 per cent oleum corresponds to an addition of $4955 \times 104.5/100 = 5178$ pounds of 100 per cent H_2SO_4. 24,034 pounds $-$ 5178 pounds 100 per cent H_2SO_4 = 18,856 pounds 100 per cent H_2SO_4 that are yet to be added.

This acid is to be prepared from 20 per cent oleum and from 98.56 per cent sulphuric acid. This 98.56 per cent acid contains 80.45 per cent of its weight SO_3: $80.06/100.00 = x/98.56$. Using formula (3) page 555 and calculating on the SO_3 content, we find that 4723 pounds of 20 per cent oleum are required. (Desired conc. $-$ actual conc.)/(conc. strength sol. $-$ actual conc.) $\times$ amount sol. desired or given = conc. stronger sol. to be added or taken. $(81.63 - 80.4)/(85.31 - 80.4) \times 18{,}856 = 4723$ pounds.

The amount of 98.56 per cent H_2SO_4 that is to be added is now calculated, and found to be 14,133 pounds.

Thus, 18,856 pounds 100 per cent H_2SO_4 $-$ 4723 pounds 20 per cent oleum = 14,133 pounds 98.56 per cent H_2SO_4.

Formula (1), p. 556, $y = z - x$, or amount weaker solution to be added or taken = amount of solution desired or given minus amount of stronger solution to be added or taken.

The total amount of 20 per cent oleum to be added is 9678 pounds = 4955 pounds + 4723 pounds = 9678 pounds.

And thus, to make the required mixture, we add to the acid already in the tank: 9678 pounds of 20 per cent oleum, 14,133 pounds of 98.56 per cent H_2SO_4, and 34,905 pounds of 94.5 per cent HNO_3.

RECTANGLE METHOD FOR THE DILUTION AND CONCENTRATION OF LIQUIDS AND MIXTURES, AND FOR THE FORMATION OF ALLOYS OF DEFINITE COMPOSITION

The figures expressing the percentage concentration of two solutions (or those of one solution, and the figure 0 *for water*, where dilution with water is desired) are written in the two left hand corners of a rectangle, and the figure expressing the desired concentration is placed on the intersection of the two diagonals of this rectangle.

Now subtract the figures on the diagonals, the smaller from the larger, and write the result at the other end of the respective diagonal. These figures then indicate what quantities of the solutions whose concentration is given on the other end of the respective *horizontal* line, must be taken to obtain a solution of the desired concentration. For example, to make a 12 per cent solution, by mixing an 8 per cent and a 15 per cent solution we prepare Fig. 1 which indicates that we have to take 3 parts by weight of the 8 per cent solution and 4 parts by weight of the 15 per cent solution to obtain (7 parts by weight of) the 12 per cent solution.

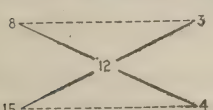

Fig. 1

Again, if we wish to dilute a 25 per cent solution so as to obtain a 9 per cent solution, we place the figure 25 in, for example, the upper left corner of a rectangle and place the figure 0 (concentration of the solution in pure water) in the lower left corner, and then place the figure 9 (desired concentration) at the point of intersection of the diagonals, and subtracting across the diagonals, we obtain Fig. 2: 9 parts by weight of the 25 per cent solution, if mixed with 16 parts by weight of water, will give 25 parts by weight of a 9 per cent solution.*

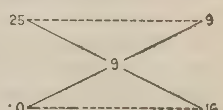

Fig. 2

1. To prepare a definite amount of a dilute solution, by diluting a strong solution of a substance with water, or with a weak solution of the same substance.

See examples 1 and 2 page 558.

* By A. Cobenzl, Wiesloch, Baden. From Compendium der prakt. Photographic, Prof. F. Schmidt, 9th Ed. p. 379. See also for explanation, problems 1 and 2 under the heading: "Formation of Mixtures of Definite Composition," p. 558.

1. How many pounds of H_2O and how many pounds of a 60 per cent H_2SO_4 must be mixed to obtain 400 pounds of a 34.2 per cent H_2SO_4?

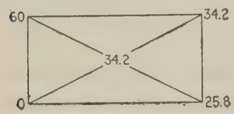

Fig. 3

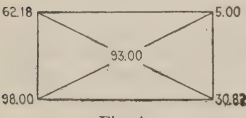

Fig. 4

By Fig. 3, 34.2 parts of a 60 per cent H_2SO_4 and 25.8 parts of H_2O, if mixed, will give 60 parts (34.2 + 25.8) of a 34.2 per cent H_2SO_4.

Or, 34.2/60 parts of a 60 per cent H_2SO_4 and 25.8/60 parts of H_2O will, if mixed, give 1 part of a 34.2 per cent H_2SO_4 and 400 parts of a 34.2 per cent H_2SO_4 will require 400 times these quantities of H_2SO_4 and of H_2O.

2. How many pounds of a 62.18 per cent H_2SO_4 must be added to 1000 pounds of a 98 per cent H_2SO_4 to make of the whole a 93 percent H_2SO_4.

Argument same as above.

5 + 30.82 = 35.82. 5/35.82 of the 62.18 per cent acid + 30.82/35.82 of the 98 per cent acid will give 1 part of a 93 per cent acid. Etc.

2. Dilution of a definite amount of solution, thus producing a greater amount than this of a more dilute solution.

See examples 1, 2, and 3 page 557.

(1) We wish to know the weight of water to be added to 800 pounds of a 73 per cent H_2SO_4 to make, of the whole, a 70 per cent acid. If 3 parts of H_2O added to 70 parts of a 73 per cent H_2SO_4 will give a 70 per cent acid, then X parts of H_2O added to 800 parts of a 73 per cent H_2SO_4 will also give a 70 per cent acid: $3/70 = X/800$, $X = 34.29$ pounds H_2O.

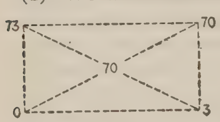

Fig 5

(2) How much 0.1012 N solution must be added to 1000 cc. of a 0.5009 N solution to make of it a 2 N/10 solution?

If 0.3009 parts of the 0.1012 N solution added to 0.0988 parts of the 0.5009 N solution will produce a 2 N/10 solution, then X parts of the 0.1012 N solution added to 1000 cc. of the 0.5009 N solution will also give a 2 N/10 solution:

$$0.3009/0.0988 = X/1000,\ X = 3045.5 \text{ cc. } 0.1012 \text{ N solution.}$$

3. Preparation of a definite amount of a stronger solution from a weak solution, by the addition of a solution of a higher concentration than that of either of the two solutions on hand.

See example 1 page 558.

(1) How many pounds of an 80 per cent acetic acid and of a 60 per cent acetic acid must be mixed to make 500 pounds of a 65 per cent acetic acid?

Five pounds of the 80 per cent acid added to 15 pounds of the 60 per cent acid will give 20 pounds of a 65 per cent acid. 5/20 parts of the 80 per cent acid + 15/20 parts of the 60 per cent acid will require 500 times these quantities:

$$500 \times 5/20 = 125 \text{ pounds 80 per cent acid,}$$
$$500 \times 15/20 = 375 \text{ pounds 60 per cent acid.}$$

4. Concentration of a definite amount of solution by the addition of a more concentrated solution of the same substance, thus producing a greater amount of a concentrated solution.

See example under (4) page 558.

(1) How many pounds of an 80 per cent H_2SO_4 must be mixed with 980 pounds of a 35 per cent H_2SO_4 to strengthen the whole to a 40 per cent acid? If 5 parts of an 80 per cent acid added to 40 parts of a 35 per cent acid will produce a 40 per cent acid, then X parts of an 80 per cent acid added to 980 parts of a 35 per cent acid will also produce a 40 per cent acid.

$$5/40 = X/980, \ X = 122.5 \text{ pounds of an 80 per cent } H_2SO_4.$$

DILUTION TO A CERTAIN SPECIFIC GRAVITY

The method to be described is not strictly accurate, on account of the small contraction of volume, on melting together of metal, when forming alloys, or when mixing solutions of different densities, but this does not introduce an error that is appreciable in ordinary work.

Under this head comes the problem that Archimedes had to solve: The problem of the Crown. The following discussion will explain the principles involved.

How many parts by weight, x grams, of a metal of the specific gravity S, and how many parts by weight, y grams, of another metal of the specific gravity S_1, are there in n parts, by weight, of an alloy of these two metals, of the specific gravity S_2,

$$x + y = n; \quad \frac{x}{S} + \frac{y}{S_1} = \frac{n}{S_2}; \quad \text{then} \quad y = n - x;$$

and

$$\frac{x}{S} + \frac{n - x}{S_1} = \frac{n}{S_2};$$

whence

$$S_1S_2x + SS_2n - SS_2x = SS_1n, \quad \text{or} \quad x = \frac{nS\,(S_1 - S_2)}{S_2\,(S_1 - S)}.$$

Similarly we obtain

$$y = \frac{nS_1\,(S - S_2)}{S_2\,(S - S_1)}.$$

PROBLEMS

112. What percentage of "Oil of Vitriol" (O. V.) (93.19 per cent H_2SO_4) is equivalent to 62.18 per cent of sulphuric acid (100 per cent)? (b) What percentage of 50° Bé sulphuric acid (62.18 per cent H_2SO_4) must be taken to be equivalent in strength to O. V.?

(a) 62.18 per cent $\times$ 100 = x per cent $\times$ 93,
x per cent = 62.18 per cent $\times$ 100/93.19.
(b) 93.19 per cent $\times$ 100 = x per cent $\times$ 62.18,
x per cent = 93.19 per cent $\times$100/93.19.
(a) 0.6219/0.9319 = x/100 = 66.72 per cent.
(b) 0.9319/0.6219 = x/100 = 149.87 per cent.

113. What is the result of the analysis of an oleum containing SO_2, being given the following data:

For total acid, as SO_3:

Weight of oleum taken = 3.0570 gr.
N/1 NaOH required = 74.30 cc.

For sulphur dioxide:

Weight of oleum taken = 7.0510 gr.
N/10 I sol. required = 46.80 cc.

The reaction for the sulphurous acid and the iodine is

$$H_2SO_3 + I_2 + H_2O = H_2SO_4 + 2\,HI.$$

Ans. Free SO_3 = 80.33 per cent; SO_2 = 2.13 per cent; H_2SO_4 = 17.54 per cent.

114. What is the composition of an oleum, the data of the titration of which, having used phenolphthalein as an indicator, are as follows:

For total acid:

Weight of acid taken = 5.0000 gr.
1.112 N NaOH to neutralize = 99.95 cc.

For sulphur dioxide:

Weight of acid taken = 5.0000 gr.
N/10 I sol. required = 39.00 cc.

Ans. Free SO_3 = 33.10 per cent.
H_2SO_4 = 64.40 per cent.
SO_2 = 2.50 per cent.

100.00 per cent.

115. 300 pounds of oleum containing 33% of free SO_3 and 67% of H_2SO_4 are equivalent to how many pounds of oil of vitriol (93.19% H_2SO_4)?

Ans. 345.82 lbs.

116. How many pounds of oleum containing 33% of free SO_3 and 67% of H_2SO_4 must be added to 100 pounds of 85% H_2SO_4 to make oil of vitriol?

Ans. 53.64 lbs.

117. (a) 600 pounds of an 89.55 per cent sulphuric acid is equivalent to how many pounds of oil of vitriol (93.19 per cent H_2SO_4)?

(b) And to how many pounds of 50° Bé sulphuric acid (62.18 per cent H_2SO_4)?

Ans. (a) 576.6 pounds; (b) 864.12 pounds.

118. What is the percentage of 100 per cent sulphuric acid, equivalent in strength (a) to a 20 per cent oleum? (b) To a 30 per cent oleum?

Ans. (a) 104.5 per cent; (b) 106.75 per cent.

119. (a) What is the percentage of oil of vitriol equivalent in strength to a 25 per cent oleum? (b) What is the percentage of a 98 per cent sulphuric acid, equivalent in strength to a 35 per cent oleum?

Ans. (a) 113.34 per cent; (b) 110.08 per cent.

120. Calculate the amounts of acid required to make 34,000 pounds of a mixed acid to consist of 65.9 per cent H_2SO_4, 18.1 per cent HNO_3, and 16 per cent H_2O. There are still in the tank 3780 pounds of an acid, consisting of 42 per cent H_2SO_4, 52 per cent HNO_3, and 6 per cent H_2O. It is desired to employ, besides this acid in the tank, a quantity of acid that is on hand, and that is to be "worked off." This consists of 7000 pounds of a mixed acid composed of 64 per cent H_2SO_4, 28 per cent HNO_3, and 8 per cent water.

93.2 per cent H_2SO_4, 52.3 per cent HNO_3 and water are on hand, and are to be used to help give the mixture the desired composition. How many pounds of these two acids and of water are required to accomplish this?

Ans. 17,531 pounds 93.2 per cent H_2SO_4;
4260 pounds 52.3 per cent HNO_3;
1429 pounds water.

121. How many pounds of a 98 per cent and a 96 per cent sulphuric acid and a 61.4 per cent nitric acid must be taken to make 60,000 pounds of a mixed acid, to be composed of 46 per cent H_2SO_4, 48 per cent HNO_3, and 6 per cent H_2O?

Ans. 28,163 pounds 98 per cent H_2SO_4;
26,711 pounds 96 per cent HNO_3;
5126 pounds 61 per cent HNO_3.

122. It is required to make a mixed acid composed of 46 per cent H_2SO_4, 49 per cent HNO_3, and 5 per cent H_2O with the aid of a 96 per cent and a 61.4 per cent nitric acid, and of a 98 per cent sulphuric acid. How many pounds of each must be taken to prepare 60,000 pounds of the mixed acid?

Ans. 28,163 pounds 98 per cent H_2SO_4;
28,474 pounds 96 per cent HNO_3;
3363 pounds 61 per cent HNO_3.

123. How many pounds of a 95 per cent nitric acid and of a 30 per cent oleum must be added to each 1000 pounds of a mixed acid, composed of 43 per cent H_2SO_4, 51 per cent HNO_3, and 6 per cent H_2O, to convert this mixture into a mixed acid of the composition: 42 per cent H_2SO_4, 53 per cent HNO_3, and 5 per cent H_2O?

Ans. 137.07 pounds 95 per cent HNO_3; 71.38 pounds 30 per cent oleum.

124. It is required to make 61,320 pounds of a mixed acid of the composition, 41 per cent H_2SO_4, 56 per cent HNO_3, and 3 per cent H_2O. The mixing tank contains 2604 pounds of an acid composed of 52 per cent HNO_3, 42.5 per cent H_2SO_4, and 5.5 per cent H_2O. How many pounds of a 20 per cent

oleum, a 98.56 per cent sulphuric acid, and a 94.50 per cent nitric acid must be added to the acid already in the tank?

Ans. 4678 pounds 20.00 per cent oleum;
14,133 pounds 98.56 per cent H_2SO_4;
34,905 pounds 94.50 per cent HNO_3.

125. 37,000 pounds of a mixed acid are to be made. It is to consist of 41 per cent H_2SO_4, 52 per cent HNO_3, and 7 per cent H_2O. In the mixing tank there is still, from a former lot, a residue of 6720 pounds, consisting of 42 per cent H_2SO_4, 52.54 per cent HNO_3, and 5.46 per cent H_2O. How many pounds of a 98 per cent and a 94.7 per cent H_2SO_4 and a 61.4 per cent HNO_3 must be added to the acid already in the tank to make a mixture of the above composition?

Ans. 12,599.6 pounds of the 98 per cent H_2SO_4, 15,689.3 pounds of the 94.7 per cent HNO_3, and 1991.1 pounds of the 61.4 per cent HNO_3.

126. Sodium hydroxide and trisodium phosphate are to be determined in the presence of each other. Phenolphthalein reacts neutral to disodium phosphate; therefore, in titrating a mixture of these two salts with sulphuric acid, and employing phenolphthalein as an indicator, we have:

$$2\,NaOH + H_2SO_4 = Na_2SO_4 + 2\,H_2O,$$
$$2\,Na_3PO_4 + H_2SO_4 = 2\,Na_2HPO_4 + Na_2SO_4.$$

45 cc. of 0.5 NH_2SO_4 are required for these titrations.

Methyl orange, which is alkaline to disodium phosphate, but neutral to monosodium phosphate, is now added, and the titration is continued with 0.5 N H_2SO_4:

$$2\,Na_2HPO_4 + H_2SO_4 = 2\,NaH_2PO_4 + Na_2SO_4.$$

35 cc. are required. What amounts of trisodium phosphate and of sodium hydroxide are present? *Ans.* 0.20005 gr. NaOH; 2.8707 gr. Na_3PO_4.

127. What is the composition of a solution of mixed tri- and disodium phosphates, if the phenolphthalein titration requires 25 cc. of a 0.5 N sulphuric acid, and the methyl orange titration requires 35 cc. of a 0.5 N sulphuric acid, in addition? *Ans.* 0.71025 gr. Na_2HPO_4; 2.0505 gr. Na_3PO_4.

128. What is the result of the analysis of an oleum containing SO_2, having given the following data:

For total acid, as SO_3:

Weight of oleum taken = 3.0570 gr.
N/1 NaOH required = 74.30 cc.

For sulphur dioxide:

Weight of oleum taken = 7.0510 gr.
N/10 I sol. required = 46.80 cc.

The reaction for the sulphurous acid and the iodine is

$$H_2SO_3 + I_2 + H_2O = H_2SO_4 + 2\,HI.$$

Ans. Free SO_3 = 51.23 per cent.
SO_2 = 2.13 per cent.
H_2SO_4 = 46.64 per cent.

129. What is the composition of an oleum, the data of the titration of which, having used phenolphthalein as an indicator, are as follows:

For total acid:

Weight of acid taken = 5.0000 gr.
1.112 N NaOH to neutralize = 99.95 cc.

For sulphur dioxide:

Weight of acid taken = 5.0000 gr.
N/10 I sol. required = 39.00 cc.

Ans. Free SO_3 = 33.10 per cent.
H_2SO_4 = 64.40 per cent.
SO_2 = 2.50 per cent.
100.00 per cent.

130. A solution of sulphuric acid, after testing is found to contain 0.049205 grams of acid per cubic centimeter. How many cubic centimeters of water must be added to a kilogram of this solution to make it N/1?

Ans. 3.20 cc.

131. How much 0.2019 N sodium hydroxide and how much water must be taken to make 5 liters of N/10 sodium hydroxide? (Consider the densities of the two liquids to be the same, in this and other problems, unless otherwise mentioned.)

Ans. 2391.2 cc. NaOH; 2608.8 cc. H_2O.

132. 50 cc. of a solution (factor to N/10 = 1.005) correspond to 48.90 cc. of another solution. How many cubic centimeters of water, per liter, must be added to this second solution to make it N/10?

Ans. 28.00 cc.

133. How many grams each of a 0.5012 N and of a 0.1078 N solution must be mixed to make 5 kilos of a 2 N/10 solution?

Ans. 756.6 gr. of the 0.1078 N solution; 234.4 gr. of the 0.5012 N solution.

134. How many pounds of an 80 per cent acetic acid must be added to a 92.60 per cent acetic acid to make 600 pounds of a 90 per cent acid?

Ans. 123.8 pounds 80.00 per cent acid; 476.2 pounds 92.60 per cent acid.

135. How many pounds of a 20 per cent hydrochloric acid must be added to 800 pounds of a 43 per cent hydrochloric acid to convert this quantity of acid into a 30 per cent acid?

Ans. 1040 pounds.

136. How many pounds each of a 30 per cent oleum and of a 98 per cent sulphuric acid must be mixed, to prepare 100 pounds of a 100 per cent sulphuric acid? (Calculate on the percentages of SO_3 present in each.)
Ans. 22.82 pounds 30 per cent oleum; 77.18 pounds 98 per cent H_2SO_4.

137. A solution of sulphuric acid, after testing it, is found to contain 0.049205 gram of acid per cubic centimeter. How many cubic centimeters of water must be added to a kilogram of this solution to make it N/1?
Ans. 3.20 cc.

138. How much 0.2019 N sodium hydroxide and how much water must be taken to make 5 liters of N/10 sodium hydroxide? (Consider the densities of the two liquids to be the same, in this and other problems, unless otherwise mentioned.) *Ans.* 2391.2 cc. NaOH; 2608.8 cc. H_2O.

139. 50 cc. of a solution (factor to N/10 = 1.005) correspond to 48.90 cc. of another solution. How many cubic centimeters of water, per liter, must be added to this second solution to make it N/10? *Ans.* 28.00 cc.

140. How many grams each of a 0.5012 N and of a 0.1078 N solution must be mixed to make 1 kilo of a N/5 solution?
Ans. 756.6 gr. of the 0.1078 N solution; 234.4 gr. of the 0.5012 N solution.

141. How many pounds of an 80 per cent acetic acid must be added to a 92.6 per cent acetic acid, to make 600 pounds of a 90 per cent acid?
Ans. 123.8 lbs. 80 per cent acid; 476.2 lbs. 92.6 per cent acid.

142. How many pounds of a 20 per cent hydrochloric acid must be added to 800 pounds of a 43 per cent hydrochloric acid to convert this quantity of acid into a 30 per cent acid? *Ans.* 1040 lbs.

143. How many pounds each of a 30 per cent oleum and of a 98 per cent sulphuric acid must be mixed to prepare 100 pounds of a 100 per cent sulphuric acid? (Calculate on the percentages of SO_3 present in each.)
Ans. 22.82 lbs. 30 per cent oleum; 77.18 lbs. 98 per cent H_2SO_4.

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Parsons, S. J.: Malleable Cast Iron. Melting; Moulding; Annealing; Cleaning and Straightening; Design; Patterns; Inspection and Testing; Supplementary Processes; Application. 90 illustrations. 8vo. Cloth. London, 1909............................net 2.50

Philip, Arnold: The Electro-Plating and Electro-Refining of Metal. Second Edition, revised. Being a new edition of Alexander Watt's "Electro-Deposition." 162 illustrations. 6×8. Cloth. 704 pp. London, 1911.......................................net 4.50

Rose, T. Kirke: The Precious Metals. Comprising gold, silver and platinum mining, smelting and assaying. 46 illustrations. 8vo. Cloth. 311 pp. (Van Nostrand's Westminister Series.) New York, 1909..net 2.00

Rowe, J. P.: Practical Mineralogy Simplified. For mining students, mines and prospectors. $5\frac{1}{4} \times 7\frac{3}{4}$. Cloth. 162 pp. New York, 1911...net 1.25

Ruer, Dr. Rudolf: Privatdozent at the University of Göttingen. Elements of Metallography. Authorized Translation by C. H. Mathewson, Ph.D., Instructor in Chemistry and Metallography at the Sheffield Scientific School of Yale University. 8vo. xiv + 342 pp. 119 figures. Cloth................................net 3.00

Sexton, A. H.: Alloys (Non-Ferrous). 137 illustrations. 8vo. Cloth. 298 pp. Manchester, 1909..........................net 3.00

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Stevens, H. J.: The Copper Handbook. This book lists and describes 8130 mines and mining companies in all parts of the world. Vol. X., 1910–1911. Completely revised. 6×9. Buckram. 1902 pp. Houghton, Michigan, 1911.................................... 5.00
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Cohnheim, O.: Enzymes. Six lectures delivered under the Herter Lectureship Foundation at the University and Bellevue Hospital Medical College. $5\frac{1}{2} \times 7\frac{3}{4}$. Cloth. 183 pp. New York, 1912. net $1.50

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Moore, F. J.: Outlines of Organic Chemistry. A book designed especially for the general student. Illustrated. 12mo. Cloth. 324 pp. New York, 1910 .... net 1.50

Noyes, W. A., Prof.: Illinois. Organic Chemistry for the Laboratory. 2. durchgeseh. u. erweiterte Aufl. XI und 291 S. 1911. The Chemical Publishing Co., Easton, Pa. Zt. f. angew. Chem. 1911, S. 2156 ....

Remsen, Ira: An introduction to the Study of the Compounds of Carbon or Organic Chemistry. Fifth revision. Illustrated. 12mo. Cloth. 441 pp. Boston, 1909 .... net 1.20

Roscoe, H. E., and **Schorlemmer, C.:** A Treatise on Chemistry. Vol. I. The Non-Metallic Elements. Fourth Edition. 226 illustrations. 6×9. Cloth. 967 pp. London, 1911 .... net 5.00
Previously published: Vol. II. The Metals. 259 illustrations. 6×9. Cloth. 1400 pp. London, 1907 .... net 7.50

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Practical Dry Cleaner, Scourer, and Garment Dyer. Edited by W. T. Brannt. Fourth Edition, revised and enlarged. 41 illustrations. $5\frac{1}{4} \times 7\frac{1}{2}$. Cloth. 371 pp. Philadelphia, 1911. . . . . net 2.50

Practical Manual of Cloth Finishing. Comprising the finishing of woollen, worsted and union fabrics. By the editors of "The Dyer and Calico Printer." Illustrated. $6\frac{1}{2} \times 9\frac{1}{4}$. Cloth. 316 pp. London, 1911. . . . . net 8.40

Rothery, G. C., and **Edmonds, H. O.:** The Modern Laundry. Its construction, equipment and management. Including dry cleaning and dyeing, by A. Morris. In two volumes. $7\frac{3}{4} \times 10\frac{3}{4}$. Half morocco. London, 1911. . . . . net 15.00
Vol. I. 7 plates. 348 pp. . . . .
Vol. II. 6 plates. 314 pp. . . . .

Trotman, S. R., and **Thorp, E. L.:** Principles of Bleaching and Finishing of Cotton. 131 illustrations. $6\frac{3}{4} \times 9$. Cloth. 359 pp. London, 1911. . . . . net 5.00

WATER SUPPLY AND SANITATION

Bailey, E. H. S., Ph.D.: Professor of Chemistry, University of Kansas. A Text-book of Sanitary and Applied Chemistry or The Chemistry of Water, Air, and Food. New York, 1906. Reprinted 1908, 1910. Cloth. 345 pp. 12°. . . . . net 1.40

Baskerville, Chas.: Municipal Chemistry. A series of thirty lectures by experts on the application of the principles of chemistry to the city, delivered at the College of the City of New York, 1910. 251 illustrations. $16\frac{1}{2} \times 9\frac{3}{4}$. Cloth. 535 pp. New York, 1911. . . . . net 5.00

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—— Sewage Purification and Disposal. 71 illustrations. 8vo. Cloth. 229 pp. Pittsburgh, 1909. . . . . 3.00

Don, John, and **Chisholm, John:** Modern Methods of Water Purification. 96 illustrations. 6×9. Cloth. 384 pp. London, 1911. net 4.20

Fuller, G. W.: Sewage Disposal. 80 illustrations. $7 \times 9\frac{1}{2}$. Cloth. 783 pp. New York, 1912 .... net $6.00

Kershaw, G. Bertram: Modern Methods of Sewage Purification. A guide for the designing and maintenance of sewage purification works. Illustrated tables, 36 plates. $6\frac{3}{4} \times 9$. Cloth. 369 pp. London, 1911 .... net 7.50

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Moore, E. C. S. and **Silcock, E. J.:** Sanitary Engineering. A practical treatise on the collection, removal and final disposal of sewage and house refuse, and the design and construction of works of drainage and sewerage with numerous hydraulic tables, formulæ and memoranda including an extensive series of tables of velocity and discharge of pipes and sewers. Two volumes. 500 illustrations. 101 folding plates. 160 tables. 8vo. Cloth. 880 pp. London, 1909. net 14.00

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Naylor, W.: Trades Waste. Its treatment and utilization. With special reference to the prevention of river pollution. 21 plates, 27 folding diagrams, and numerous illustrations. 6×9. Cloth. 283 pp. Philadelphia, 1912 .... net 6.50

Ogden, H. N.: Rural Hygiene. 79 illustrations. $5\frac{1}{2} \times 8$. Cloth. 451 pp. New York, 1911 .... net 1.50

—— and **Cleveland, H. B.:** Practical Methods of Sewage Disposal. For residences, hotels and institutions. 52 illustrations and plates. $6\frac{1}{4} \times 9\frac{1}{4}$. Cloth. 138 pp. New York, 1912 .... net 1.50

Richards, Ellen H.: Instructor in Sanitary Chemistry, Massachusetts Institute of Technology, and Alpheus G. Woodman, Assistant Professor of Food Analysis, Massachusetts Institute of Technology. Air, Water, and Food from a Sanitary Standpoint. Third Edition, revised. 8vo. 278 pp. Illustrated. Cloth. 2.00

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Trentham, W. H. and **Saunders, James:** Modern Methods of Sewage Disposal. A practical handbook for the use of members of local authorities and their officials. Illustrated. 12mo. Cloth. 68 pp. London, 1909 .... 1.25

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The following list is made up of only such books as have been reviewed between August 1, 1908, and January 1, 1913, in such readily and generally accessible journals as the " Photographische Korrespondenz," " Zeitschrift für angewandte chemie," and " Zeitschrift für Chemie und Industrie der Kolloide."

In these reviews attention is often called to errors and misstatements. Valuable information relating to the subject matter of the book is frequently added by the reviewing specialist. This fact alone will make it worth while in many cases to look up the reference, whether one is interested in any particular book, or only in the subject matter covered by such a book.

AGRIKULTURCHEMIE UND DAZU GEHÖRIGES — FORSTWISSENSCHAFT

Baumhauer, Dr. Heinrich: Freiburg im Breisgau. Leitfaden der Chemie, insbes. zum Gebrauch an landwirtschaftlichen Lehranstalten. Zt. f. angew. Chem. 1911, S. 890, 2156. I. Teil: Anorg. Chemie, 6. Aufl. mit 34 Abb. 1911. Herdersche Verlagshandlung........ M2.70
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Ehrenberg, Paul: Theoretische Betrachtungen über die Beeinflussungen einiger der sogen. physikalischen Bodeneigenschaften. Ein Anfangsversuch einer landwirtschraftlichen Kolloidchemie Sonderabdruch aus den Mitteilungen der landw. Inst. der Kgl. Universität Breslau. 1908. O. Parey, Berlin........

Grossmann, H.: Die Stickstofffrage und ihre Bedeutung für die deutsch. Volkswirtschaft. 1911. M. Krayn, Berlin. Zt. f. angew. Chemie, 1911, S. 1741........

Haselhoff, Emil, Prof.: Marburg. Agrikulturchemische Untersuchungsmethoden. 1909. G. J. Göschen, Leipzig. Zt. f. ang. Chem. 1910, 601........ M0.80

Huber, Rob., Dr.: Zur Stickstofffrage. 116 S. 1908. Staempfli & Co. Zt. f. ang. Chem. 1909, 331.

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Jurisch, Konrad W., Dr.: Salpeter und sein Ersatz. 356 S., 2 Bildwissen, 45 Abb. 1908. S. Hirzel, Leipzig. Zt. f. ang. Chem. 1908, S. 2108........

Stickstoffdüngung. Sonderabdruck aus: "Salpeter und sein Ersatz." 1908. L. Hirzel, Leipzig........................

Kaiser, Karl, Prof.: Der Luftstickstoff und seine Verwertung. Bd. 313 aus "Natur und Geisteswelt." 1910. B. G. Teubner, Leipzig. Zt. f. ang. Chem., 1911, 648............................

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Löhnis, Dr. F.: Landwirtschaftlich-bakteriologisches Praktikum. 3 Taf. und 40 Abb. 1911. Gebr. Bornträger, Berlin. Zt. f. ang. Chem. 1912, S. 65.......................................geb. M3.40

Passon, Max, Dr.: Kleines Handwörterbuch der Agrikulturchemie. 1. Teil Aadl-Kynurensäure. 2. Teil Lab-Zymogen. 1910. W. Engelmann, Leipzig. Zt. f. ang. Chem. 1910, 700............... M25.00

v. Schneider, W., Dr.: Mineralische Düngemittel und Ernteerträge. 1909. N. Kymmel, Riga. Zt. f. ang. Chem. 1910, 601..........

Schröter, E.: Die Rauchquellen im Königreich Sachsen und ihr Einfluss auf die Forstwirtschaft. Heft 2 der Sammlung von Abh. über Abgase u. Rauchschäden. Hrsg. von H. Wislicenus. Paul Parey, Berlin. Zt. f. ang. Chem. 1910, 210.................... M4.00

Schucht, L.: Die Fabrikation des Superphosphats mit Berücksichtigung der anderen gebräuchlichen Düngemittel. Ein Handbuch. 3. verb. u. verm. Aufl. 1909. Vieweg & Sohn, Braunschweig. Zt. f. ang. Chem. 1910, 162................................ M20.00

Stoklasa, Dr. J.: Biochemischer Kreislauf des Phosphations im Boden. 1911. Gustav Fischer, Jena. Zt. f. ang. Chem. 1912, S. 28......

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Adressbuch sämtlicher Bergwerke, Hütten und Nebenbetriebe Deutschlands, 1908–09. 5. Jahrg. 1908. H. Kramer, Dresden. Zt. f. ang. Chem. 1908, S. 2346............................ M6.00

Alt, Heinrich, Dr.: München. Die Kälte, ihr Wesen, ihre Erzeugung und Verwendung. Bd. 311, "Aus Natur u. Geisteswelt." 1910. B. G. Teubner, Leipzig. Zt. f. ang. Chem. 1911, 791...........

Asmus, Joh.: Torfkoks und Kraftgas. 1908. A. Seydel, Berlin. Zt. f. ang. Chem. 1909, 187................................ M1.00

Aufhäuser, Dr.: Hamburg. Vorlesungen über Brenntoffkunde. 1910. Boysen & Moasch. Zt. f. ang. Chem. 1910, 2040......... M2.00

Beltzer, Francis J. G., Prof.: Paris. Die moderne industrielle Chemie. 2. Teil: Anorg. chem. Industrie: Die Metalloide, 687 S. 1909. Société d'Éditions techniques, Paris. Zt. f. ang. Chem. 1910, 743...

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Blücher, H.: Auskunftsbuch für die Chemische Industrie. 7. Aufl. 1910–11. 1911. Franz Siemenroth, Berlin. Zt. f. ang. Chem. 1911, 841 .... M15.00

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le Coutre, Walter: Calcium-Carbid und seine volkswirtschaftliche Bedeutung für Deutschland. 1909. Dr. Wedekind & Co., Berlin. Zt. f. ang. Chem. 1910, 412 .... M3.00

Dichmann, C.: Der basische Herdofenprozess. 1910. Jul. Springer, Berlin. Zt. f. ang. Chem. 1911, 790 .... M8.00

Friese, Wilhelm: Die Asphalt-und Teerindustrie. 1908. Dr. Max Jänicke, Hannover. Zt. f. ang. Chem. 1908, 2010 .... M5.00

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Harper, W.: Die Destillation industrieller und forstwirtschaftlicher Holzabfälle. Erw. deutsche Bearb. von R. Linde. 1909. J. Springer, Berlin. Zt. f. ang. Chem. 1910, 162.................. M10.00

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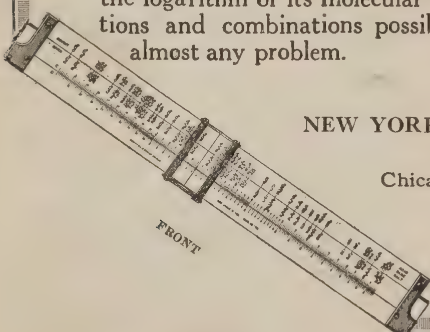

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